A NATURALIST'S HOLIDAY

EDWARD STEP F.L.S.

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Idle Hours on the
Cornish Coast

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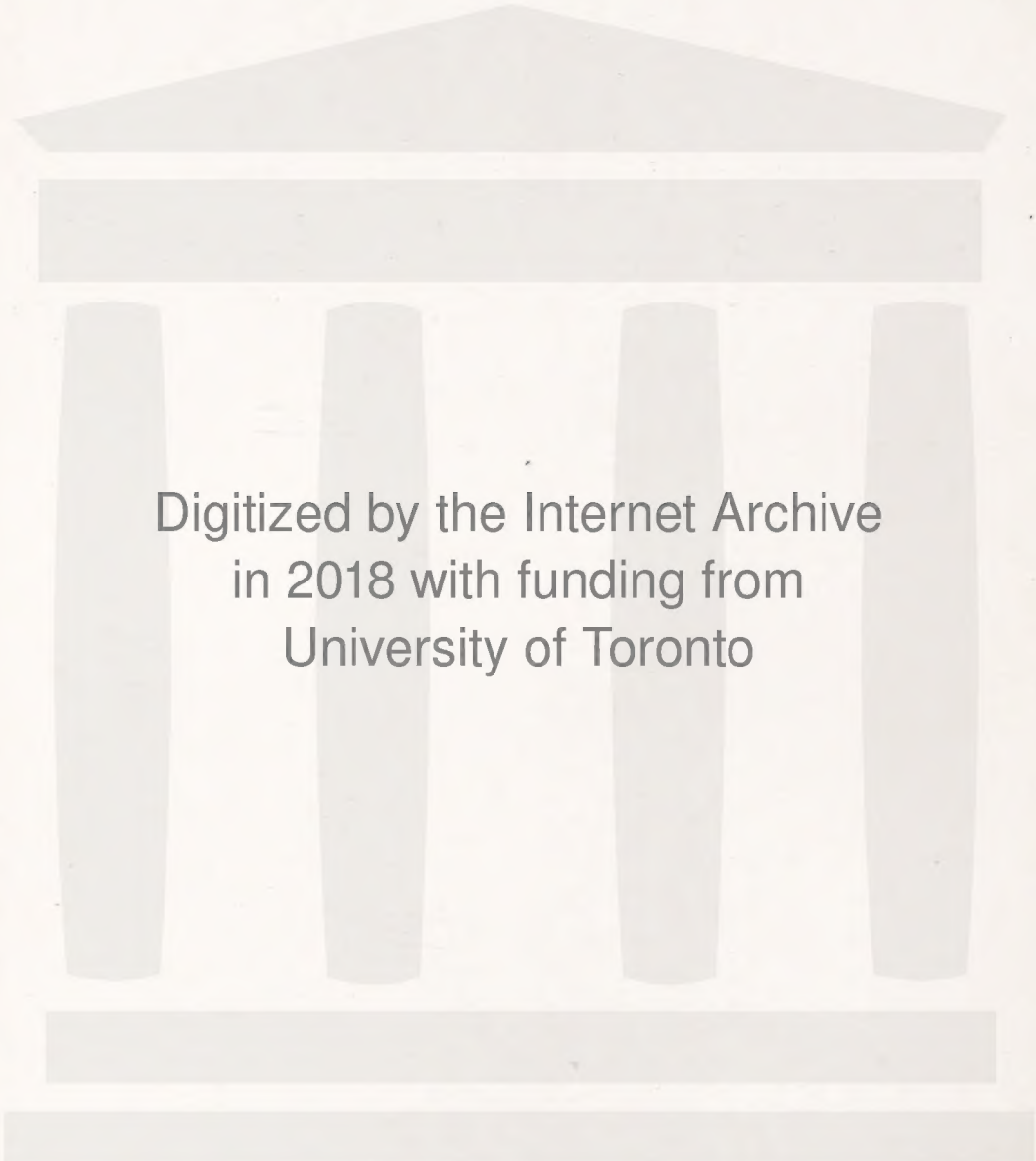
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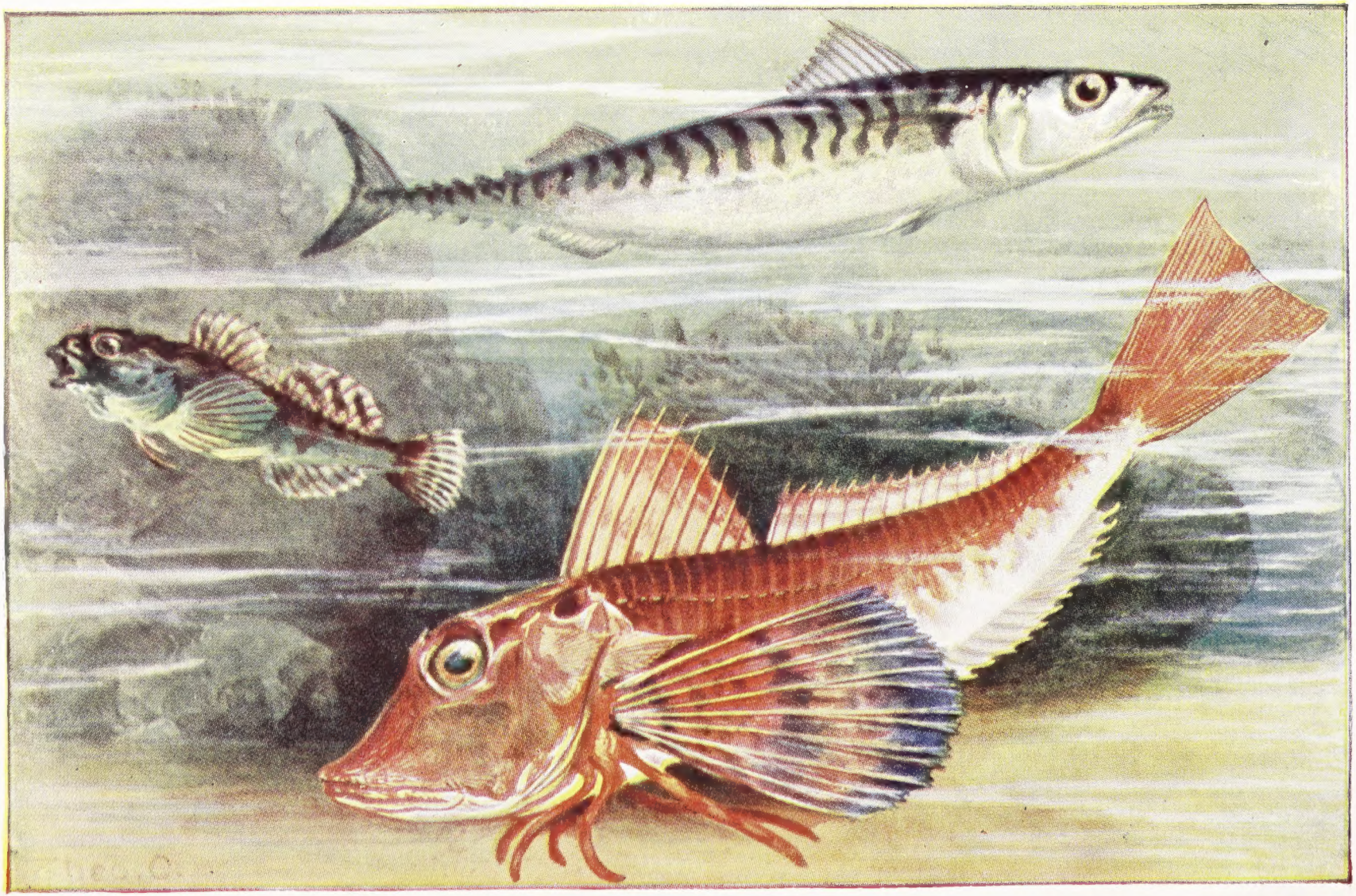

Father-lasher. *Sapphirine Gurnard.* *Mackerel.*

A NATURALIST'S HOLIDAY

IDLE HOURS ON THE CORNISH COAST

EDWARD STEP, F.L.S.

Author of "By the Deep Sea," "In Flora's Realm," "Shell Life," etc.

WITH SEVENTY-FIVE ILLUSTRATIONS BY THEO. CARRERAS, MABEL E. STEP, AND THE AUTHOR

Thomas Nelson and Sons

London, Edinburgh, Dublin and New York

PREFACE.

THE title of this volume is a concession to those friends who declare that my four and a half years' sojourn in a Cornish coast village was one long holiday. The truth is, I had retreated thither for quiet literary and scientific work; but my protests to this effect not having been regarded seriously, I have at length decided to bow to their superior knowledge of what constitutes a holiday, and to accept their view of the matter. This course has become more easy to take now that several years of London life lie between me and my pleasant idlings among the rocks and the rambles along cliffs and sands.

Nearly all the following papers have appeared in various magazines; and I take this opportunity of thanking the proprietors of *The Windsor Magazine*, *Good Words*, *The Leisure Hour*, *The Girl's Realm*, *Young England*, and *The Boy's Own Paper* for permission to reprint certain of them.

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A NATURALIST'S HOLIDAY.

I.

A SCHOOL OF MACKEREL.

"SWISH!"

What was that? The noise had aroused me from peaceful slumbers, and I sat up in the semi-darkness of the early dawn (3 a.m.), listening.

"Swish! rattle!" came again as a handful of gravel struck the window and fell back upon the iron roof of the veranda; then there followed a subdued but distinct cry of "Hubba! hub—ba-a!"

That was enough. In an instant I knew why I was called, and was out of bed in the twinkling of an eye, making signs at the window that I would be down on the shore in a few minutes. To every man and woman in the village that one word "hubba"

has great significance. Freely translated it means "fish," and its utterance stirs up our enthusiasm, just as the word "rats!" appeals to the aggressive instincts of the well-bred terrier.

The gravel-throwers pass on to call others, and almost as soon as they can regain the open space known as the Lugger, I have completed a very hasty toilet and am with them. Going down to the porth, we embark in the boat that carries the "stop-net" and row out to the sean-boat at her moorings in "the pit." There are ten of us, of whom seven are put aboard the sean-boat, three remaining to work the stop-net. I am one of the sean-boat's crew; and we immediately set to work, fixing tholes, hauling the grapnel, and seeing that everything is in place. Then six of us bending to the huge oars, the big boat is soon under way; and having shot across our little bay, we round Pentolvadden Point, and bring up in a big "drang" or cleft in the rocks.

Making the boat fast and leaving one of the crew in charge, we all scramble up the rocks to the summit of the point, where we sit on the turf—now bright with vernal squill and sea-pink—and eagerly scan the sea all round. The whole of Gerrans Bay is open to our view, from the majestic Nare Head and

its apparent outpost, the Gull Rock, around by wild Penreda Cove, with its colonies of jackdaws, ravens, and shags, Carne, with its round-barrow beacon, and Pendower's extensive sweep of sand and beach, to the picturesquely situated, white-fronted houses of Portscatho, running half-way around its own little inner bay and ending only where the rocks of the Cabe slope down into the sea. It is a glorious prospect when there is full daylight, but as yet the sun has not risen over the Nare, whose backbone is clothed in white mists. These mists have brought on a wind that ruffles the surface of the water in a manner we do not like, for it makes it less easy to see the fish rising. But the old hands tell us the sun when he rises will eat up the mists, and the schools of mackerel will then "play up" in order to warm their noses. We can see individual fish rising all around and leaping slightly out of the water, and between us and the Gull Rock they are rising in great numbers within a restricted area, over which the herring-gulls are ever wheeling and settling, uttering their cat-like cries. Our leader advises a move in that direction, and in an instant we are all rushing over the edge and leaping and jumping down the sharp and precipitous rocks to the boat.

Our Village.

To let the boats go clear of the rocks and set all the oars working rhythmically is the work of seconds only. The command "Head boat" is given; the sun peeps over Penreda, and we make straight along the golden pathway he throws down upon the sea. The fish are leaping all around us, but, so far, it is only the irresponsible gambolling of individuals; the schools are lying low, like Br'er Rabbit. We pull in the oars and "lay to," all eyes straining to catch sight of the familiar black patch heaving above the surface, and all ears listening for the rattle of the fish as they rush in thousands through the deep.

"There they go! Look, look!" "Oh, the beauties! Play up, play up!"

Ah, but they are too far out, in water too deep for our sean—eleven fathoms deep—to secure them; but they are heading towards Penreda, and they may soon be in water shallow enough and clear enough of rocks to warrant us in shooting the sean. We are all standing on the thwarts watching, all seeking to repress our excitement; but the school soon disappears. We wait and watch patiently, eagerly catching at any sign that has the least promise in it—the movement of the gulls, the colour of the water, the leaping of the fish. But all to no purpose: the mists again blot

out the sun and roll down over Carne and the Nare Head, until these and the Gull Rock are but dimly seen as dark masses through the heavy vapour. The tide too has turned, and is now well on the ebb. Our chances for this morning are gone. However, mackerel-seaners do not readily give up the ghost of a chance. We wait around for awhile, sitting on our oars whilst the old hands retell the old, old yarns of former catches—marvellous catches some of them—with thrilling incidents connected.

At length, with general consent, the order is given "Home!" and the sean-boat turns her head to Portscatho, whilst the stop-net boat tows at the stern.

The weather clears at mid-day. The sun eats up the mists; the wind shifts to the east, but does not gain in strength. Schools of fish are seen from the lugger "playing up" grandly near the Gull Rock. Towards evening a look-out is posted on Pentolvadden. "The hubba is out," and all is got ready for another start. I am at my desk, but with an eye cast occasionally out to the porth. There is a tap at my low study window, and a lad inquires if I am ready, as the rest of the crew are in the boat waiting to put off. Throwing down my pen and seizing my cap, I am soon over the rocks and stepping to my place in the

sean-boat. "Give way, lads!" and we give way and make for Round House, an eminence on the cliffs farther up the bay. Here the boats "lay to" among the rocks whilst we watch from the heights above. We have not long to wait, for soon a fine school appears "within the range of practical politics."

It would be awkward for any quiet, nervous person that might be upon the rocks below when we become convinced of the imminence of a catch. We are all on fire, and fly down steep and dangerous places at a break-neck pace to reach the boats. Every one quickly slips into his place, the boat is backed out of the drang, her head turned, and then she shoots forward. Not too hurriedly, quickly but carefully, we move up to the black, bubbling mass, nearly a boat's depth out of the water, coming on with a loud rustle and rattle. There is no question this time as to our chances. Look, there are two schools, or two heads to one school; and there, away on the starboard quarter, is another school. For which shall we go?

We decide upon the one nearest at hand, though we know it is over the rocks, and rocks are far from being the best places upon which to shoot. There is danger of the "foots," or bottom rope of the sean, being caught, and so preventing proper "warping;"

or of the net being torn, and the fish thus allowed to escape. However, we determine to take all risks, and the sean is shot. It had lain, a huge brown heap, in its proper "room" or compartment of the

Shooting a Sean.

boat, all ready for shooting, with the keg-buoy on top.

The sean measures a hundred and eighty fathoms in length by eleven fathoms deep. As soon as we come close to the school of fish, the keg is thrown

overboard and the sean is rapidly paid out, whilst the boat is rowed with all speed round the now excited body of fish. We are no less excited, and urge each other on to greater efforts.

As soon as the keg is thrown over and the sean-boat moving in one direction from it, the stop-net is attached and shot in the opposite direction. In two or three minutes the circle is completed, and then each one gives vent to his feelings, and yells advice and orders to his fellows. At the same time each is occupied in "keeping up the heads"—that is, holding up the head-ropes where, from the pull of the tide or the pressure of the fish, there is danger of them going under water; or in splashing the water with his oar to frighten the fish into the "cod" or centre of the sean, and prevent their rushing to the side where the ends overlap.

What a babel! Oh, the din and confusion of tongues! Everybody plainly tells the others they are a parcel of fools and know nothing of the business. "Pull in the foots!" "Skim up the twine!" "Look sharp, you idiot! do you want to lose them all?" "Not so fast; we must warp her." "We can't warp her here; she'll go to pieces!" "Take that punt round and hold up the head!" "No, you stop here

and beat; if you touch those heads I'll heave this tiller at *your* head!" "Yah, there's a crab-pot!" "Row in with that punt carefully and lift the wretched thing out!"

All these things and many others are said simultaneously; and though they may help the picturesqueness of the scene, they scarcely can be held to conduce to success. The punt rows carefully over the heads, splashing the while to keep the fish away; seizes the crab-pot and hauls it up, smelling horribly by reason of the extremely high bait it contains. The punt is then rowed carefully out again, and the crab-pot dropped out of the way. All this time the fish may be seen rushing hither and thither across the space enclosed by the sean, though the great body of them remains concentrated in a black surging mass near the cod.

Now the most laborious and tedious part of the business commences. A thick rope is attached to the sean, and the big boat is rowed straight to shore, leaving the stop-net boat on guard, and to keep the fish in the middle of the sean. We pay out our rope as we go, and when we reach land the grapnel is taken out, and fixed ashore where it will be able to withstand our united strain upon it. The use of a square-

holed plate of iron inserted in the centre thwart now becomes apparent; so also is the presence of some other things explained. A long iron bar is passed through this hole, its foot fitting a corresponding hole in the bottom boards. Then a capstan head is fitted upon this point, and two long wooden bars are thrust through holes in the capstan, projecting half-way on either side. The rope attached to the sean is given three turns round the capstan, and then we seize the wooden bars and turn it as rapidly as we can, winding in the rope slowly but surely, and so "warping" the sean and its contents nearer the shore. After upwards of an hour of this work, which has long since become a labour, the sean is drawn close alongside the sean-boat, and the stop-net boat is beyond the sean. We reach over the side and pick up the head-ropes, the "foots" are also seized near the stern of our boat, and the end of the sean thus dragged on board, and stowed in its "room."

"Down minnies! down minnies!" is the cry, and one of us seizes a stone ball attached to a line, and rapidly drops this in the water, withdraws and drops it again repeatedly to frighten the mackerel to the farther side of the enclosure, until we have hauled in sufficient of the sean to make escape of the fish

impossible. Quickly but carefully most of the one hundred and eighty fathoms are pulled on board, until only a small circle of net remains in the water, enclosing a large number of excited mackerel.

Now the "tucking-maund" is in request—a somewhat shallow basket, through which water may readily escape, but mackerel cannot. Our friend in the stop-net boat, whilst we uphold the heads, dips in the maund, and brings it out filled with leaping, wriggling, glistening masses of living silver. It is a thrilling moment, and every one grows excited afresh as maund after maund comes up full, and is emptied into the stop-net boat. Cheers, expressions of delight with the beauty of the sight, and exclamations of satisfaction at the size and apparent numbers of the fish, break forth from all; and by this time we are becoming hemmed in by boats of enthusiastic friends who have seen our goings on from the village a mile away, and have put out in boats to cheer us. All fall to estimating the round total of the catch, and seem agreed upon considerably exaggerating the number. It is arranged to sell as many as may be required in Portscatho, and to send the remainder to Falmouth.

The last mackerel having been tucked, and the

last fathom of net skimmed, we ship the long oars again and pull for the porth. About a quarter of a mile from the shore we raise three ringing cheers that may be heard not only in the village, but by the scattered population in farms around, and by the time we reach the porth the people are hurrying down the slips and steps to the rocks at the water-side, bringing plates, pails, baskets, and money to buy some mackerel. The fish are still alive and "kicking," and we hand them out at the reasonable price of ten for a shilling! Such mackerel as they are too! such gloriously tinted creatures as a Londoner who knows the mackerel of his markets can form no conception of. Neither will the specimens purchased in those markets at three or four for a shilling give him any notion of the fine flavour of the really fresh fish that has known no packing, and no long journeying between the sean-boat and the consumer.

Another boat is now brought alongside, in which the bulk of the catch will go to Falmouth, and into this the fish are counted by two men, who in turn take up three fish at a time and count them as one. When forty-one has been counted in this manner, the next one says "Tally!" which signifies the completion of a hundred—really one hundred and twenty-six, or

three times forty-two. Our catch amounts to eleven hundred and a quarter, Cornish, which is really over fourteen hundred by standard reckoning. Some of those have been sold at the boat side, others shared among the crew, in this case seven each, and the remainder sent to market, where they realize from eight to eighteen shillings a hundred (126). Ours fetched ten-and-six a hundred. The money is dealt with after this fashion: one half goes to the boat—that is, the proprietors; the other half being equally divided among the crew, which includes some of the proprietors, who thus get a double share—one for their capital, one for their labour.

The foregoing is a brief sample of the procedure adopted in catching the mackerel by seaning. There are other ways in which he is caught—by driftnets, long-lines, etc.—but with these methods we have nothing to do at present. Sometimes the school captured by the sean is smaller, sometimes greater, as many as six thousand fish being at times "shut" at one operation. Too often the fish are seen from the shore "playing-up" well, but on pursuit persist in remaining in deep water above uneven rocks, where an attempt to warp would result in the loss of the fish and the destruction of the sean. Time after time

the boats go out and wait about on the watch for hours, and return empty; so that should they at times get a really heavy catch, it is fully deserved and earned by many previous attempts that have ended in total failure.

II.

THE PRAWN AS A PET.

AT my elbow in my study there is a curious assemblage of vessels—small rectangular boxes with glass fronts, deep white porcelain dishes, black ebonite dishes, bell-glasses, clear glass jars, thin tumblers—all containing sea-water and various examples of marine life, that I may have them handy for observation. I do not propose to give you a catalogue of the contents; it is sufficient to say it is a motley crowd representative of many orders of zoology, at which I glance from time to time, perhaps for a few minutes, perhaps for an hour. The creatures thus held captive are always worth looking at, and one at times sees things—incidents and situations—one could never observe in the sea or the rock pool.

In several vessels there are, among other things, prawns—some of them great fellows with magnificent

antennæ streaming from the front of the head and extending far beyond the four plates of the broad tail. He who has only seen the prawn as he appears on the table can have but little idea what a splendid fellow he is before he is boiled. No knight in armour was ever better clad than he, for his perfect-fitting,

Prawn.

well-hinged mail is ever renewed before it has a chance of showing signs of age or wear. Then, too, he appears to be well armed with that formidable saw-edged rostrum that stands out well an inch before his eyes, and which is calculated to strike terror into the heart of an enemy. But that is by no means

the only advantage Nature has given him. His eyes, in common with those of other crustaceans of the order *Podophthalma*, are mounted on footstalks with universal joints, enabling him to protrude them well away from their sockets and to see before, behind, above, below, to right and left. And then, as though it was remembered there would be times when the prawn could not see, there were added those long and sensitive antennæ with ears in their basal joints. It is *not* the habit of the prawn to trail these behind him as so generally represented in natural history books. The error comes of drawing from museum specimens, without the artist having knowledge of the living creature's habits. The very long, outer antennæ he sticks out at right angles with the body, in which position they serve a similar purpose to the whiskers of a cat, and so he is made aware of danger at once. Of the branches of the inner and smaller antennæ one pair is held vertically above his eyes, and a pair pointed before him.

Some of my prawns reside in a deep bell-glass nine inches across, but only just large enough to accommodate a big Opelet Anemone that sits like a queen on a serpentine rock in the middle, and elevating her broad brown column, spreads out her beautiful crown of

long, lithe, green, pink-tipped tentacles. These prawns have an anxious time, and their numbers gradually decrease. They have not sufficient space to jump back well out of reach of this Medusa with the adhesive snake-locks. But it is no easy task for the Opelet to catch a prawn, in spite of her one hundred and eighty fingers, which are long enough to reach every part of her domain.

In another vessel are two rough pieces of stone taken from the rock pools on the shore below, because of the plentiful growths of weed upon them. Many of the smaller fry of marine life inhabit these weed masses, and one is at times startled by the queer forms that make their appearance on the edge of their jungle. One of these stones is covered with a healthy growth of the *Enteromorpha*, which appears to be a favourite food with all crustaceans. There are several small anemones on the stones, but around them are larger specimens of some of the prettiest of our native species, such as the Gem Pimplet and the Snake-locked Anemone. These I feed occasionally. It should be mentioned, for the benefit of those not intimately acquainted with anemone-life, that, in common with many other of the less highly organized creatures, they do not look for four or even three

"square meals" *per diem,* but that as few in the course of a moon will be quite sufficient to keep them in health. A small piece of sole or plaice is what I prefer to give them, as it appears to agree well with their digestive organs; pollack or mussel they do not despise, and they are quite partial to oyster; but with this luscious bivalve at its present market value, it requires some self-sacrifice to give anemones what so well suits the human organism. I feed the prawns at the same time on similar food; and though it is interesting to watch the little bits of fish seized by the tentacles of the anemones, and disappearing in their mouths, it is far more so and a prettier sight to see the prawns feed. It is a delight to observe the way in which the delicate little "hand" is used to pick up fragments and convey them to the outer door-like cutting jaws that shield the mouth. But not only so far may we watch the food, but after it has passed into the mouth and beyond; for the young prawn's plates of mail are of crystal, and his flesh is almost as transparent, and all that transpires in his internal economy may be noted with ease.

I have said that I provide food for the prawns as well as for the anemones; but the prawns have a notion that the food given to them is an inferior cut

to that dealt out to the anemones, so after partially demolishing his own portion, a prawn will creep up over a stone and look into the mouth of an anemone where a piece of fish is just on the point of vanishing. An antenna is waved over it just as the magician waves his wand over something he wishes to transform or render invisible; then a dainty little yellow-and-blue-barred hand is stretched forth, the nippers close, and with a dexterous flap of his tail the prawn has darted backward to the extreme limits of the vessel and dragged the piece of fish clean out of the anemone's digestive cavity.

It is astonishing how rapidly the prawn becomes aware of any fresh introduction to its little world. Just now I quietly dropped in two minute crabs, and in less than a second of time each one was being overhauled by inquisitive prawns, who touched him with their antennæ, and put their little pincer hands to his mouth to be sure whether he had brought anything to eat with him of which the prawns might relieve him. Then they appeared to be asking his name, his port of origin, and whither bound. His answers did not appear to be satisfactory, so, like custom-house officers or official searchers, they, so to speak, made him turn his pockets out, and felt all

over his body and limbs to see whether he had any contraband articles concealed on his person. The astonished—and, I fancy, indignant—crab stiffened his legs and put up his pincer claws in the favourite manner of all crabs, large and small, when there is any semblance of danger—that is, if there is no hole handy into which they can dart. But such tactics could not alarm the prawns. They are too much of kin with the crabs to be imposed upon by this minatory attitude, and they proceeded leisurely with their examination, which ended with a second inspection of the crab's jaws to make quite sure he had concealed nothing there. This business concluded, they left the crab to his own devices, and began chasing each other in their playful fashion. There can be no doubt as to the spirit of fun that animates these little fellows, when one sees how they delight to stand at safe distance from an anemone and slyly tweak the tip of his tentacles with their little hands.

Prawns readily settle down to aquarian life, and in about a week are so tame that if a finger-tip be put in the water, two or three prawns will prance towards it, and cling to it, examining it critically. I like to see a prawn coming up over the top of a stone, there is so much grace in his movements.

Whilst he walks with his three pairs of ordinary walking legs, his larger pair of pincers are busy examining the surface of the stone; then the finer pair of pincers are brought into play, and he picks up some fragments that are invisible to us, and which are transferred to his mouth with the dexterity of John Chinaman with his chopsticks. These fine pincers are not carried extended, ready for ordinary use, as are the larger ones, but the first joint is folded back over the next, and the delicate limbs are thus carried close against the jaws, to be secure against accidents; they are only brought into use on special occasions for delicate work, such as picking up the minute *Entomostraca*, upon which prawns feed.

There is a regular bogey in one of the vases, who prevents the prawns leading lives of too sedentary a character, and of which the adult prawns may make use for keeping their younger kin in the right path, for fear the bogey-fish will have them if they do wrong. I had some notion of this sort in my mind when I put him there, and the prawns are such intelligent creatures that they rose to the idea at once. My bogey, then, is a young specimen of the grotesque fish called a Father-lasher. His aspect may be judged by the fact that it is merely his villainous

expression that has earned him his name; not, I believe, that he has ever been taken in the act of chastising his parent, but on the ground that if there is anything in Lavater's theory, he is quite equal to the enormity of fighting his own father. I feel sure, however, that a more intimate acquaintance with the Father-lasher would soften down the, at first sight, repulsive lines of his face. However, I must not enter upon his defence just now; and to avoid a long and tedious description, will merely say that his appearance is what nine persons out of ten would write down as "repulsive;" the tenth, anxious to give him a character, would probably say—especially if he saw the Lasher yawn, as he does when bored—that he has a fine *open* countenance. The one fixed notion that possesses the Father-lasher's brain is this: that it is his whole duty in life to spring up, open-mouthed, and chase every moving object he sees. He is a heavy, clumsy fellow, who lies like a stone—which he closely resembles in tint—among the weeds or under a rock, and dashes out at everything that passes by. It is this trick that makes him a terror to my juvenile prawns. The older ones know they are too agile for him, and they move calmly backwards from him without flurry, much after the manner of the London

street-orderly boy, who waits until the feet of the dashing 'bus horse have almost kicked his shoulder before he quietly moves aside. I am bound to say that the Father-lasher rarely succeeds in catching anything large in the prawn line—he has better fortune with small crabs and the fry of other fishes; but, all the same, the small shrimps in my aquaria have a wholesome dread of him, which, I am sure, must make for a healthy development of their moral character.

III.

LIFE IN A ROCK POOL.

ONE of my favourite recreations is to slip down the cliff road, just beyond the coastguard's look-out, and lounge about on the rocks at the foot of the Cabe when the tide has gone back. The high cliffs run southward with many indentations and undulations until, a mile away, they put out another long foot called the Greeb. Sitting or lying on the rocks of Pencabe, we can see a good length of the cliff path as it ascends from Peter's Plash over the high hump above Raven's Hole. You may watch the waves flinging their white crests against the ragged rocks by Breakneck, and the yellow cliff above them, covered just now with the profuse rosy blossoms of sea-pink or thrift, the silvery-white flowers of sea-campion, and the yellow-green of the sprouting samphire. Both sea-pink and samphire come down over

Butterfish. *Shanny.* *Butterfly Blenny.*

the rocks of the Cabe to high-water mark, their roots squeezed between the flakes of the slate rocks. There is no sharp line of demarcation between marine and maritime vegetation—no neutral zones, too dry for

"The waves flinging their white crests against the rugged rocks."

seaweeds and too wet for terrestrial plants. The sea-milkwort comes lower down even than sea-pink, and the orange-lichen, *Physcia*, lower still; whilst the black *Lichina pygmæa* spends half its time in the water and the other half drying itself, in company

with that true seaweed, the channelled wrack (*Pelvetia*).

So, also, the sea twice a day encroaches on the shore, and twice a month comes higher still to show there is no hard and fast line set as boundary betwixt sea and land. And when it retires every twelve hours, it leaves detached portions of itself as samples of the whole in little basins its own sharp teeth have bitten in the hard rocks. Many persons come to the Cabe to bask in the sun on its rocks, and to watch the larger vessels going up or down the Channel and the fishing craft nearer the shore. They see the masses of colour up the cliffs, the gannets and cormorants and gulls wresting a living from the waves, the glorious, ever-varying colours of sea and sky, the Gull Rock and the distant headlands, may even mark the bunches of sea-fern over the mouth of the cave and the rock pipits flitting low along the rocks; but few of them see these pools. They know the rocks are pitted with holes, which fill with water and present traps for the unwary, but it is the proverbial one in a thousand who knows how to adjust his vision to see through the water and watch the life that teems in each of these minute oceans. Keenness and adaptability of vision are yet not all that are requisite for

pool-gazing. A man must be able to humble himself, to lie prone upon the rocks, and his garments must not be of too fine a character for contact with the sharp edges of acorn shells. He should have also something of the artistic sense, the faculty for discerning beauty of form and colour, even though it be presented to him in such cheap things as seaweeds, shells, anemones, and other creatures of low estate.

You, gentle reader, we assume to be possessed of these qualifications, and so we take your hand to guide you over the sharp edges of rocks, and permit you to peep into some of our favourite pools. For, mark you, every pool is not a replica of its fellows—by no means. This pool has its ends east and west, that one lies north and south ; the next is shielded by a high rock betwixt it and the sea, so that it gets no sun till late in the day, and its waters are cold. A slight difference in aspect or exposure may make a great difference in the species of seaweed which will grow in that basin, and, given a difference in the flora, you may confidently rely upon a corresponding diversity of fauna. Again, the question of altitude has something to do with the matter, though the highest pool may be only a dozen feet above the lowest in vertical height. The highest pools get a

change of water only at the spring-tides, those nearest the sea are only uncovered at the same period, whilst the intermediate range of pools gets 730 changes a year. Then there is the diversity of form, which has important bearings on the question of inhabitants, just as the style of architecture will influence a man in renting or buying a house. A shanny past the juvenile stage of existence likes space for a sharp, quick run through the water, and convenient little caves at either end of his journey in which to hide; he would not look with favour upon one of those clean-walled, circular pots in the rock, which are merely pools in the making, with only the faint beginnings of vegetation. Until the sea has, by rattling stones round it for a long period, considerably enlarged it, the tenants will not take possession, though a few may look in at one tide and be off at the next.

Another class of pool is remarkable for the swarms of prawns within it. This is almost certain to have a flat stone across the concave bottom, allowing space beneath for a cool, roomy retreat. Then we shall come across some in which anemones of several species are the chief occupants. In most cases their harmonies of colour render them invisible at first, but

they are gradually revealed to that careful scrutiny of the whole pool, inch by inch, which is the only practical plan if one really wishes to see all it contains. In this pool there is the material for a volume, if one were faithfully to record its inhabitants and their ways. At present we may merely glance at a few of its living contents and briefly note some characteristic of each, without attempting life-histories.

This pool is of medium size, and appears to have had its origin in a natural fissure of the rock, its length running parallel with the cliffs. The sea cast in pebbles, and by keeping these in rapid motion at every incoming of the tide fretted its sides and widened it considerably. On the seaward side the rocks slope away, and afford a convenient though not very yielding couch, upon which we may recline, with our head and shoulders just over the edge of the pool. Some small fishes rush away in alarm and disappear. Never mind; perfect stillness will bring them back again. The floor of the pool and part of its sides are covered with overlapping scales of pinkish hue—one of the so-called corallines, formerly supposed to be of similar nature to coral, but now known to be a seaweed (*Melobesia*), which secretes a limy coat much as the crab secretes its shelly covering. Here and there

is a bare, oval patch with the blue-gray of the rock showing up. This is the "pitch" of a limpet, who is now ranging around after food; he will return by-and-by to the identical spot, and you will then see not a trace of the bare rock. Look! here are numbers of limpets, though you fail to identify them; and small wonder, for their shells in these pools are either covered with shapeless masses of coralline or with tufts of vegetation, which completely disguise them. Here is a good example. See, we will lift it with our knife from its close contact with the rock, and drop it in this glass jar that you may witness the beauty of its vegetation. Here are two-inch lengths of the green *Enteromorpha,* whose fronds are irregularly-shaped tubes, which become distended with the oxygen gas they give off; they are then thought to resemble animal intestines—hence their name. This plant is a most efficient aid to keep sea-water sweet, and many marine animals appreciate it as food. But you are particularly struck by that miniature clump of mimic ferns that springs from one side of the shell. This is the *Bryopsis plumosa,* a lovely weed that has no common name. It is remarkable in the fact that the entire frond consists of but one cell. What appears to be a mid-rib is a hollow tube, and all the

branches on either side which give it the fern-like appearance are merely extensions of the same without any dividing walls.

Watch and keep still. Here are those fish again, appearing to view quite as strangely as they vanished. See, they are coming up the sides towards us, with little jumps forward, clinging to the wall by means of their ventral fins, which they commonly use as feet. They are young Shannies or Smooth Blennies—playful little fellows which are among the most inquisitive as well as most plucky of fishes. We quietly slip in a finger-tip, and immediately four or five of them converge upon it and bob their noses against it. Were there a good-sized individual among them, he would rush at it with his dog-like mouth open and give it a nip with his close-set, tiny teeth. This propensity appears to be due less to viciousness than to the playful character of the fish. Not that we wish to make out that the Shanny cannot exhibit vice. See him when he comes across a limpet whose shell is raised from the rock; how he will seize the shell in his jaws, and try his best to pull the adhesive "foot" of the mollusk from the rock. We have seen him succeed in this attempt, and then rush round the pool, hammering the limpet against the rocks

in his well-considered but futile efforts to break the shell.

There is another little fish here very similar to the Shanny, but with a fringed crimson crest, which it erects at will, between its eyes; and its tail and fins are likewise tinged with crimson. This is Montagu's Blenny, and he will show himself quite as playful as the Shanny. Occasionally, too, we may find a specimen of the Butterfly Blenny, which is a kind of glorified Shanny, with larger and more rounded fins behind the gill-covers, and the first division of the back-fin more elevated, and marked with a large deep-blue spot surrounded by a lighter ring.

The Shanny does not strike us as a graceful swimmer; his progress through the water is not wanting in rapidity, but it is a heavy, blundering rush, and in deep, open water he would not have a chance against a pursuer. In the pool that sudden rush with several splashes serves admirably. It diverts attention for an instant, which is ample time to enable the Shanny to sink heavily against the floor or wall of his pool, and, lo! he is invisible. His indescribable, inconstant colouring is a matter of transverse streaks and spots, ever varying in strength and tint to harmonize with his surroundings. You look

for him, but fail to see him, though he is just under your nose, and watching you intently with those intelligent eyes.

If the Shanny is a clumsy fish, how may we describe the Father-lasher (*Cottus*), which nearly approaches to tadpole form, and whose open mouth discloses an enormous cavern with a very small exit at the farther end. The Father-lasher lives under a stone, whence he rushes forth at any moving thing. His head is armed at all points with long or short stout spines, the longest of which are about the gill-covers and behind the eyes. By the inflation of the rounded gill-covers, the Father-lasher forces these spines into a more threatening position, to the end that he may assume a more ferocious aspect even than when they are at rest. To most persons he is repulsive; yet those who know

Father-lasher and Squat Lobster.

him intimately would consider "somewhat grotesque" to be a more fitting description. His colouring is splendid, though the markings on his body and fins are very indefinite, like those of the Shanny. Father-lasher also is one of the chameleons of the sea. If his retreat is draped with green weeds, he also is green; if he lives on a bare stony bottom, he is gray, with lighter and darker lines and dots; but if, again, he dwells among crimson weeds, he glows with crimson tints. Such an one was brought to us the other day from deeper water, where red is the prevailing hue of the weeds, and the Father-lasher was a splendid creature, though a foolish one. He had attempted to swallow a spiny Squat Lobster, from the same region, and of the same red colour plus some transverse lines of vivid blue across the red. It appeared as though the Squat Lobster had mistaken the Father-lasher's capacious mouth for a little cavern, into which he had shot backwards, as is the custom of Squat Lobsters. There was room in the cavern, yet the fish desired the Squat Lobster to go further, but owing to the smallness of the throat this was not possible. Then the Lasher would have spat him from his mouth again, but the Squat's spines prevented this. Had the fish's mouth been less full he might have crushed

the crustacean between his jaws, but he appeared to have lost control over them by over-relaxation of their muscles. And so he died, and his dried carcass, with the Squat's broad pincer claws protruding from the mouth, is in our possession.

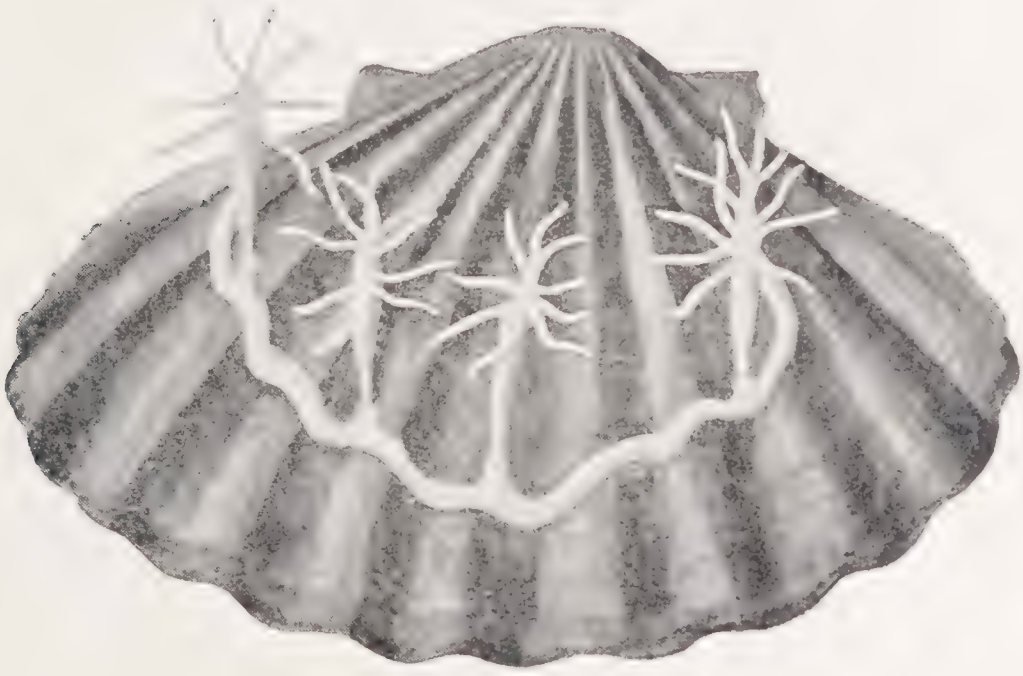
Our pool contains many species of seaweeds, some of them of singular beauty, but we must reserve them for attention at some future time. There they are, however, growing from the bottom, hanging as a

Skeleton Shrimp (Caprella).

screen before the entrance to a little grotto, or as a tapestry upon the walls. Pick off a tuft of fine weed, and rinse it vigorously in a wide-mouthed bottle of sea-water, and you will be surprised at the number of forms of life that are yours so easily. There are minute sea-snails actively ranging around, the remarkable Skeleton Shrimp (*Caprella*) sprawling about in an apparently aimless, inebriated fashion, worms of wondrous length and slenderness, with more

limbs than we can stay to count, tiny sand-stars that progress by incessant writhing of the five attenuated divisions of the body, which they will throw off on the slightest provocation—or without it. Besides the multitude of creatures visible to the unassisted vision that we shake out of that tuft of weeds, there are far more of the very minute forms of life, such as would keep an energetic microscopist happy for days. There are also the interesting forms of Hydroid Zoophytes. Many of the broken shells upon the bottom of the pool, if examined with a simple pocket lens, will be found to have colonies of these low forms of animal life upon them, as also have the less easily examined walls. Of one of these, the Club Zoophyte (*Clava*), we find a colony upon the broken valve of a Venus shell. Placing this in our bottle and viewing it from the side, we see what appears to be a row of small pinkish white pins set on end, with club-shaped heads beset with tentacles. These pins all rise from a creeping stem, the bond of union between the members of the colony. Many species of similar creatures may be found upon almost any shell or stone that the pool contains, but, of course, they are not sufficiently obtrusive to be seen by the novice without close and careful examination.

Then there are the mollusks in considerable variety; but with the exception of the Limpet and the Top-shells (*Trochus*), most of these will be found to be immature. The pools serve as nurseries for these and other creatures, which depart to the freer life of the open waters before they become full grown.



Club Zoophyte (*Clava*).

There are young Winkles in profusion in every crevice; there are the more elongated thick white shells of the Purple or Dog Winkle (*Purpura*), whose eggs, like a group of yellow ninepins, are clustered on the rocks round about; and there are a couple of species of Tops. But the one running so quickly

over the bottom is a Top-shell with a new tenant inside; no mollusk ever exhibits so much haste as that. The present occupant is a young Hermit Crab, such as are abundant between tide-marks, though you will not get a fair-sized specimen except from deep water. There are usually several young specimens in every pool; but when they get too large for the largest of our Top-shells, they go into deeper water, and so thrive that ultimately they become six inches long, and of such proportions that they can comfortably occupy one of the largest of whelk-shells. Then, as a rule, they are associated with two strange friends, one a beautiful worm (*Nereis*), eight or nine inches long, who shares the Hermit's cell and scavenges for him; the other an anemone, four inches high, who perches on the apex of the whelk-shell and wraps it in his broad base. But that is a story only indirectly associated with our rock pool, and we must not go further into it just now.

The mention of this parasite anemone reminds us of the anemones of our pool. These are very numerous, though it is only the common Beadlet that is at first obvious. This species is over all the rocks, many individuals perched up where the tide leaves them uncovered for hours twice every day. The Beadlet

Life in a Rock Pool.

varies greatly in colour, from bright crimson to brown, olive, and green ; and one would suppose that it would make use of its colour variation for protective purposes, but it always appears pretty strongly contrasted with the rock, upon which it sits fully exposed. Other anemones harmonize with their surroundings so nicely that they become invisible, but the Beadlet appears to rely for safety upon its unpleasant odour. A species plentifully represented in the pools of the Cabe is the Gem Pimplet (*Bunodes*), but usually so associated with a coralline floor that you need to have this anemone "in your eye" before you can detect it, so well does its colouring of pink and pearly gray, with oval bars of white across the tentacles, blend with its surroundings. The pimples with which its column is covered, in vertical lines, are really suckers by which it partially erects itself against a rock. The enormous and brilliantly coloured Dahlia Anemone (*Urticina*) has similar suckers, and uses them for the purpose of covering its column with gravel and fragments of shell, so that when its tentacles are withdrawn there is a rounded heap of gravel before you and no sign of the largest and—apart from its natural surroundings—most conspicuous of our anemones. There are several of them fully expanded in

this pool, yet you will not see them until we point them out to you, and then you will see them in almost every pool around, and will wonder how they eluded you before. Its broad, conical tentacles and bright hues justify comparison with a cactus dahlia, which is much more than we can say in the case of another florally-named species—the Daisy (*Cereus*). There are plenty of examples of this ill-named anemone in our pool, usually with the base fixed in a hole in the floor, and the column reaching up through the carpet of sand and *débris*, the velvety dark-brown disc and tentacles being strangely inconspicuous, and presenting the illusion of a deep hollow in the floor. The Cave-dweller (*Cylista*) is very similar in colour and habit; it mostly occupies some narrow crevice of the rock, spreading its tentacles abroad on the floor. It is readily distinguished from the Daisy by the well or ill defined capital B marked on every tentacle in black and white.

Here and there in pools we shall find a colony of the Rosy Anemone (*Sagartia*), with a buff column furnished with suckers, and the tentacles of a clear, pale, rosy tint. But the gem of our British anemones, to our mind, is the little Globehorn (*Corynactis*), which occurs in this pool, though it is most

frequently found on vertical rock faces that are uncovered only at spring-tides. It measures from a third to two-thirds of an inch either way, and when the tentacles are spread perfectly flat, the width across them may amount to an inch. Its general colouring is a transparent emerald-green column and disc, whilst the round, tapering tentacles are colourless and transparent, studded with minute points of rich brown, arranged spirally, the tentacle ending in a globular head of rosy pink. There are colour variations in which the colour is rosy-lilac, pearly-gray, dull scarlet, or pure white, with contrasting tints in the tentacles.

But here comes the tide. That little wave was a gentle reminder that the tide has been flowing quietly for some time, and that it is now time to move. In a short space our pool and the surrounding rocks will be right under water, and as yet we have had time to glance at only a few of the many things it contains. Never mind. Other days will come, and we may get the opportunity for another peep at the life of a rock pool.

IV.

"GRAN'F'ER JENKIN" AND HIS RELATIONS.

"GRAN'F'ER* JENKIN" sounds very like the name of an ancient biped; but, lest any lover of biography may be misled into supposing this is a human character-sketch, I will say at once that my subject is the possessor of not merely two legs, but of ten. He is a big crab of strange aspect, so strange that the fishermen decline to recognize him as a crab, and will credit him only with being a spider. He is well known on our southern and western coasts, where he is probably the commonest of our larger crabs, and only the Great Crab of our tables is bigger than he. In different localities he is called by different names. He is not always and everywhere "Gran'f'er Jenkin." By no means. Sometimes he is the Corwich, the Gaber, the Gab-

* Grandfather.

rick, or the Spiny Spider. Should he chance to come in the way of scientific men, they will probably use none of these names, but will speak of him as *Maia squinado.*

What some of these names signify is not very clear. "Spiny Spider Crab" has obvious relation to its prickly, round-bodied, slender-legged build, and it may be surmised that the original Gran'f'er Jenkin was a spindle-legged, prickly biped, naturally inactive, but when he moved getting into everybody's way. Then, too, the scientific appellation will bear some kind of explanation. "Gran'f'er" spends the winter and early spring in retirement—buried, it is believed, in the sand—and makes his first appearance in the crab-pots and trammels in the month of May. Hence it might be fitly termed the May crab, and *Maia* is the old Latin word for May. Herbst, who is responsible for its scientific names, says that in Provence it is called *squinado,* and therefore he thought he might adopt the word as its second or species name.

It is scarcely to be wondered at that an individual who is known under so many aliases should be fond of disguising himself; and Nature appears to have fitted him up with an eye to his tricking himself

out with all kinds of borrowed plumes, for, instead of giving him a smooth shell, like that of the Great Crab, for instance, Gran'f'er is covered all over his back with spines and clothes-hooks. If you were to see Gran'f'er after he had been into dry-dock, and had been scraped, washed, and scrubbed clean from barnacles, serpulæ, weeds, and other organisms usually found upon him, you would imagine him to be filled with the ambition to develop into a sea-urchin. Naturalists formerly held the belief that, in consequence of Gran'f'er's remarkably slow movements, the spores of plants and the eggs of animals that dropped upon his back had no chance of being swept off by their passage through the waters; and so they germinated and established themselves there. They thought it was possible that he might have a desire for cleanliness, and yet have no means for protecting himself from the rubbish that threatened to smother him entirely.

The late Rev. J. G. Wood was very fond of showing that Nature had either anticipated or given the hint for all the most useful and clever of human inventions. I do not remember what he advanced as the prototype of the fish-hook, but if he had taken one of the hooked hairs so abundant on the

back and legs of Gran'f'er Jenkin and others he would have had a very good example. Gran'f'er's back is studded with stout conical spines, and around the base of every one of these is a triple or quadruple ring of these hooked hairs. On the upper side of the walking legs the hooked hairs are crowded in straight lines, and the lower surfaces are as thickly clothed with straight, needle-pointed bristles. The nipper legs alone are free from such adornment, because they are mostly hidden beneath the overhanging front of the shell. With these nippers Gran'f'er breaks off lengths of the pod-weed, and whipping his own back with these they catch easily under the hooked hairs, and are so securely held in position that it is by no means a light task to clean him for the cabinet, so as to show the natural condition of the shell. In addition to these larger weeds there are many of a finer description, and mingled with them are some of the branching corallines, the whole forming a well-compacted coat that effectually hides the shell and catches sand and mud.

A few years ago, Dr. Graeffe of Trieste had a desire to put Gran'f'er into his aquarium and exhibit him to his learned friends; but, evidently shocked by his untidy appearance, he determined to give him

a good scrubbing first. Gran'f'er was accordingly scrubbed and scraped to such an extent that it was possible to make out the configuration of what crustaceologists call his carapace, but which we will be content to speak of as his back. The learned doctor was well pleased with his work, and considered Gran'f'er was now fit to be introduced to decent society, for the hills and valleys and hooked peaks of his upper crust stood out in bold relief. So he was deposited in a tank where he appeared to have every chance of leading a cleanly life. But in this vessel was a mass of the strange polyp *Alcyonium*, more familiarly known as dead-man's fingers; and the next morning Dr. Graeffe was alarmed to find that the polyp had been shockingly mutilated—not that this made any permanent difference to the *Alcyonium*, for polyps are extremely accommodating in this respect, and they might fitly take for the motto of the race the legend "Cut and come again!" for although snicked and sliced they are about as unconcerned as a rose-bush that has had many of its flowers gathered or its branches cut back. Like those of the rose, too, the cuttings taken off and properly planted will attach themselves and commence independent growth.

Naturally the doctor concluded that Gran'f'er had been making a meal of the dead-man's fingers, but on turning his attention to that worthy he found that the crab had been gratifying his æsthetic yearnings rather than the cravings of appetite. The crab's back was nicely ornamented with the missing particles effectively arranged. With the caution that should distinguish all men of science, Dr. Graeffe hesitated to conclude that Gran'f'er had thus decorated himself; but he decided to watch. He did so, and was rewarded by seeing Gran'f'er snip off bits of the *Alcyonium* and drop them on the floor of the tank. There they were allowed to lie for a while, and then were picked up again in the pincer claws and passed to the crab's mouth. But they were not eaten. The action was either on the principle of "kissing the place to make it well," or anointing it with a gummy saliva to make it stick, when, a moment later, it was carefully placed on Gran'f'er's back. This may be explained as a mere chance act on the part of the crab, but it has been repeated so often by various Gran'f'ers under the close observation of different naturalists that there is no room for doubt that it is an act of reason on the part of the crab. Any visitor to the seaside who

can obtain a living Gran'f'er may check the statement for himself.

The intelligence of the action may be further seen in the fact that Gran'f'er picks and snips only from those things that will grow when cut and transplanted. He knows, too, which is the "business end" of his cuttings, and plants them in the manner best calculated to enable them to "root" easily. And so before long he has covered his carapace with a very varied assortment of organisms which make him look like a respectable piece of rock, and therefore to present an unpalatable appearance to any big fish that may be looking for a meal.

It must not be supposed, however, that all the growths on Gran'f'er's back have been planted there. Some are induced to come because of the others that have been so placed; among these are various small forms of animal life that find a congenial residence, as well as a good table, among the sponges, polyps, weeds, and other growths. The microscopist who wishes to get specimens of minute marine life can scarcely do better than secure a nice Gran'f'er Jenkin and place it in a large white pan with sea-water sufficient to cover the crab's back. With a lens he can then see a multitude of creatures, most of them

strange to him, crawling over the mossy growths of algæ and sponge. Among these will be many small crustaceans, including the remarkable *Caprella*, and a much rarer form, the *Isæa montagui*, with legs specially adapted for a life on Gran'f'er's back, which is, indeed, the only place in the whole world where it has yet been found. Many other minute crustaceans abound in the same situation.

As we write there is a newly-caught Gran'f'er before us, and in the course of a few hours there have emerged from the mossy clothing of his shell immature forms of several species of mollusca, both bivalve and univalve, acorn-shells, tube-worms (*Serpulæ*), flat-worms (*Planariæ*), corallines, and no less than seven fair-sized specimens of the snake-locked anemone (*Cylista viduata*). In addition there were five or six different kinds of weeds. Altogether Gran'f'er Jenkin carries a very fair colony about with him.

I have no intention of wearying my readers with a tiresome description of Gran'f'er's personal appearance. Those who want that must seek it in the text-books. Here is his photograph, and it must speak for itself; but it should be explained that the spininess of his back does not there appear,

because I have photographed him in his war-paint, with all his decorations thick upon him, filling up the spaces between the spines and presenting a more level surface than his shell possesses. His legs are of more uniform thickness throughout and rounder

Gran'f'er Jenkin.

in section than those of the Great Crab. The pincer claws are more robust than the others in the male, but in the female and immature specimens they are much smaller. The pincers themselves are not nearly so awe-inspiring as those of the Great Crab, being

slender and almost smooth on their inner faces. The upper side of the crab, so far as it can be seen, is red; beneath, it is smooth and of a creamy-white colour. The specimen photographed was a male.

Bell, in his "British Stalk-eyed Crustacea," says: "It is eaten by the poorer classes, though I understand it is but indifferent food." Belonging to the wealthier classes, he was evidently unwilling to experiment; but, not labouring under any such disqualification, I have eaten Gran'f'er Jenkin and enjoyed his flesh. It is true one misses the masses of solid meat one gets from the huge nippers of a big Jack Crab, and the shell of Gran'f'er is very thick and solid; but if one has the patience and strength to break his legs, the flesh of Gran'f'er will be found very sweet, and by no means inferior to that of the more expensive crab from the fishmonger's shop. In a sense it is more difficult to obtain than the Great Crab, for it does not find its way to the markets. The crabbers, when they find Gran'f'er in their pots or trammels, break him in pieces and use him for bait wherewith to catch wrasse, which in turn they employ in baiting their crab and lobster pots. Richard Couch informed Bell that several dozens of this crab were sold for sixpence in Cornwall, but that

it was more frequently given away to those who asked for it. Whatever may have been the case in Couch's day, and in his part of Cornwall, my experience is that no fisherman will accept money for Gran'f'er Jenkin. His value appears to be so small that it cannot be reckoned in the coin of the realm; and unless his captor is very much in need of wrasse bait, he is always willing to give you a specimen. The Cornish crabbers say it is far too abundant on their coast, for when it gets into the crab-pots it casts off its natural lethargy and becomes so active that it frightens away the crabs and lobsters for whose benefit the seductive bait has been provided.

We have several other species of spider crab common in British waters, some rare, some exceedingly common, but all sharing in this desire to improve upon nature by titivating themselves up with living odds and ends. Some of these, though indubitably crabs, bear a very striking resemblance to *the* spiders in their long, attenuated limbs and small trunks; so much so that very few fishermen will recognize them as crabs, even though you compromise by calling them spider crabs. To them they are as much spiders as are the eight-legged creatures that construct webs in their homes and gardens.

None of the group is well known except to the few naturalists who have made a special study of the Crustacea; and as there are some very curious points in the economy of most of them, I have thought the readers of this volume would be interested in a brief account of them. One need not go beyond our own seas for examples, but one conspicuous foreigner may be mentioned — Kämpfer's Spider Crab (*Macrocheira kämpferi*), which, in the waters of Japan, can span ten or eleven feet with its long, slender legs, though the trunk to which these are articulated is only about a foot in diameter.

On glancing at almost any crab it is possible to tell by the structure of its legs and trunk what is its mode of life. That one is built for swimming through the sea, or for ascending rapidly from the bottom to the surface waters. This one is meant for slipping into crevices of the rocks on the slightest alarm, that for getting rapidly beneath them, and here again is one designed for life beneath the deep-water sands. But looking at the entire series of British spider crabs, we fail to see that any of them is adapted for any of these conditions of life. Their thick bodies, broadest behind, are ill adapted for backward burrowing or for getting into safe

retreats, for which their long, sprawling, weak limbs also unfit them. These limbs are rounded, and therefore useless as paddles, and when not as slender as grass-stems are covered with bristles or spines. Their bodies, too, are in varying degree covered with sharp spines and hooked bristles. Gran'f'er Jenkin is more spiny practically than a sea-urchin, for the spines of an urchin may be moved aside, but those of Gran'f'er are immovable.

I have mentioned several modes of life for which the peculiar build of the spider crabs unfits them, and the reader may not unreasonably expect to be informed for what occupation they are fitted. Their resemblance to spiders reminds us that these spinners use their slender limbs for the purpose of traversing their own delicate webs without breaking through. Many long-legged insects can walk over the tips of grass-blades, even as Atalanta was fabled to skip over the fields of corn—her toes were probably drawn out to an inordinate length, like the finger-bones of the bat! Several of the water-bugs walk over the surface of ponds without putting their feet in the water; and a bird of South America—the jacana—walks over the aquatic weeds by the aid of exceedingly long toes, just as our fellow-humans

in Northern Europe walk over deep snow with the aid of ski. So, too, do our spider crabs walk over and climb up and down the finer weeds in deep water, whilst the larger and heavier species lie about on mud and the soft decaying material accumulating on parts of the sea-bottom—thanks to their long legs.

It is not so easy for the reader to check this statement as it is to test the truth of what I have stated relative to terrestrial creatures, but it is not at all difficult to obtain evidence in support of my contention. In dredging for examples of the life of the deep sea, we bring up part of the bottom. The finer constituents, such as mud and sand, for the most part escape through the meshes of the dredge-net, but shells, stones, corals, weeds, etc., are retained, and from their condition we can judge the character of the bottom. When the dredge comes up half-filled with the long green ribbons of grass-wrack, among which are certain kinds of spider crabs that have cut off little bits of this grass and fastened them about their legs and bodies, we are surely justified in saying the crabs live among the grass-wrack. When, too, from another part of the dredging ground the dredge comes up full of coral, and among it are

quaintly-formed spider crabs that are obviously built in imitation of the coral, it is only exercising common-sense to say the crabs live among the coral branches. Once more, when among mud and decaying *débris* of weeds Gran'f'er Jenkin comes up with his back thickly coated with similar rubbish, we are justified in holding the belief that he spends his life upon such stuff.

Now, such situations are more or less in the open, where fishes are for ever prowling around, seeking what they may devour. Crabs and their kindred are the favourite food of many fishes, just as they are with many humans, and it requires all the craftiness of the race to enable them to survive the onslaughts made upon them. Great fecundity is one of the safe-guards against extinction, and, as we have already hinted, some have developed swimming power, or the capacity for rapidly getting beneath rocks and sand on the slightest suspicion of danger, to say nothing of the provision of formidable nippers wherewith to defend themselves at close quarters.

Nature having variously equipped the different kinds of spider crabs with hooks and spines, they have in effect decided that it would be well to make the fullest use of their endowment; so, according to

the situation each affects, he has hooked on little bits of weed in such an irregular fashion that the underlying symmetry of trunk and limbs is admirably disguised. If the females of our own race were similarly endowed with hooks, they could scarcely exhibit greater intelligence and artistic taste than are shown by some of these spider crabs in dissembling their natural beauty. This is the more remarkable because their eyes are so situated and mounted that a very limited portion of their decorated surfaces can be brought within the field of vision. However, some other sense probably comes in to help them to a satisfactory arrangement of their fal-lals; for when a specimen decked out with red weeds is placed in a tank where only green weeds are growing, the red is soon stripped off and replaced by green. Some kinds decorate both back and limbs, some the limbs only or chiefly; but in no species with which I am acquainted is any attempt made to improve the natural condition of the under surface, except the broad abdomen or "tail" of the female, when it is extended for the protection of her numerous eggs beneath—but it has then ceased to be a part of the under surface and needs disguising.

Taking a glance at the smaller of these spiders

of the sea, we find much similarity of treatment, but with nothing like slavish adherence to a family plan. The Long-legged Spider Crabs (*Macropodia*), of which we have two species, chiefly decorate their backs by getting tube-worms to construct their white, serpentine, porcelain tunnels upon it. Small saddle-oysters

Long-legged Spider Crab.

also help to disguise the crab, and bits of flimsy red weeds are stuck over back and legs in such manner that they wave about with every movement of crab or water. These species have peculiar scythe-shaped terminal joints to their walking legs, and by folding these close against the next joint they serve as sup-

plementary nippers for taking secure hold. By this means they will scramble up a trammel-net—which is set vertically—and on your attempting to gather specimens from such positions, you will find they more readily detach their legs from the body than release their hold of the net. The eyes of these long-legged species are worthy of note; they stand out at right angles from the rostrum, are of peculiar

Slender-legged Spider Crab (Inachus leptochirus).

shape, and end in a point. Cranch's Spider Crab is similar to these in many respects, but it has shorter legs, with much-curved terminal joints resembling the claws of perching birds. The back is covered with hooked hairs, and the legs with long, straight hairs spreading horizontally. It covers itself with low red weeds, which render its discovery a matter of difficulty.

Another section (*Inachus*) of the spider-crab group contains three native species, differing only in points of interest to the expert. One of them has been termed the Scorpion Spider Crab, and though we fail to see any fitness in the term, it is at least a non-technical name, and therefore may serve for present purposes. These scorpions, then, are found in deeper water, and they show a decided preference for disguising themselves with a slimy yellow sponge which they appear to plant on their backs and the upper side of their nipper-claws. One specimen I had under observation for several weeks amused me considerably. His back and nippers were covered with an even coat of this sponge, and his lesser limbs were decked out with fragments of thin crimson weed, and, to slightly alter Browning,—

> "I never could enough admire
> The wisdom of this quaint attire,"

for I found it was not only good for a disguise, but also good to eat. The tank in which I quartered him was tapestried with green weeds, and it was soon evident that he was out of harmony with his environment, for he commenced stripping off his red rags, and was not content until he had got rid of them all. Some he ate, and then set to work to

cover his limbs afresh with green gathered from his prison walls. But this was only the gossamer-like Conferva, and not of sufficient substance to be so used, so he had to abandon that design. After he had been with me for about a fortnight, it appeared as though the tank did not provide him with sufficiently appetizing food. One day I noticed he was very busy. Stretching his big arms across his back, he grabbed a handful of the sponge and brought it to his jaws, eating it with apparent relish. He made many meals after the same fashion, until his back was nearly denuded of its covering; but he was careful not to exterminate the sponge altogether, but left a little for future growth.

Of all the spider crabs commend me to Gibbs' Spider (*Pisa tribulus*) for genuine artistic industry. I should imagine that Nature had fitted him out specially for a life among sponges and corals, for his upper surface is thrown up into five or six rounded hillocks and the whole covered with a short "pile" of thick, scurfy hairs, and his legs are so distorted, drawn up, and gnarled that he appears to have suffered acutely all his life from rheumatism and chalky gout. Only the first two pairs of walking legs are of much service for walking, but the others

are admirable for clinging tenaciously to the stems of seaweeds, and for not looking like legs. And yet *Tribulus* is not satisfied with his natural disguise; he adds to it bits of weeds and corallines, and plants sponges where he thinks they will be most effective. As I write I have a pair of specimens before me,

Four-horned Spider Crab.

male and female. On the unsupported evidence afforded by his added finery, one might be pardoned for supposing the male to be a female; for his head is adorned with ostrich-feather-like plumes of coralline embedded in a patch of sponge. Behind this are set several streamers of flimsy green and crimson

weeds to wave over his back with every movement of the water. Along his sides are several patches of thin, white, calcareous sponges, so that when looked at from below these would produce the illusion of holes through the body. The first two pairs of walking legs are covered with loose, fluttering rags of weed, but the two hinder pairs are left unadorned, because they are clasped round some support and hidden beneath the crab's body. The female specimen is got up quite differently. She appears to have lacked the patience necessary for titivating herself up with bits of ribbon and feathers; she bears on her back a mass of vermilion-coloured sponge about three times her own bulk. Beneath this load she is hidden, except her walking legs, and these she has in appearance severed from her body by sticking on little patches of white sponge, like those on the male's sides, but smaller.

The last example of this remarkable family with which I shall trouble the reader is the Strawberry Crab (*Eurynome*), which does not seek to improve upon Nature. It lives among corals in deep water (15 to 25 fathoms) on our south-west coast, and is built in very close harmony with its surroundings—in fact, when away from its natural habitat it looks

as though carved out of a piece of limestone. The back is studded with broad-topped stony excrescences of a pink tint, in some cases sufficiently red to suggest the likeness to a strawberry. The limbs, too, are knobbed and twisted in such manner as makes them resemble coral branches. The nipper legs of the male are very long, but when not in use he keeps them doubled up to reduce their length one half, and to entirely destroy all resemblance to a crab.

It will be seen from this brief sketch of the ways of even so small a group as the British spider crabs that the romance of wild life may be studied in and around our own islands as well as in lands and seas thousands of miles away.

V.

MY NIGHT WITH THE CONGER.

MY study is on the ground floor, and the end window opens upon a narrow roadway passing between the house and the edge of the cliff. This is a convenient arrangement, for fishermen and other friends who have found objects of interest to a naturalist have only to pull down the upper sash, and deposit their "curios" on a shelf inside, whether I am at my post or not. One day at the beginning of September there came a tap at this window, and looking up from my desk, I beheld the face of my neighbour, Joe, who held up a bunch of squids, and asked if I knew them. Replying with an affirmative, I inquired what he was going to do with them.

"Bait my boulter," he said; "but I want a lot more. We are going after the conger to-night; would you like to come?"

Plaice. *Conger.* *Halibut*

"That I should," I replied, "if I should not be in the way."

"Not at all, sir; come, and welcome. Be down in the porth at six o'clock, for we have to catch more cuddle [cuttle] before we can bait all the hooks."

I was down in the porth at the appointed time, and took my seat in the bow of the boat. Joe was already there with his partner, Will, and they were busy cutting up the squid into long strips, and winding these round the big hooks of the boultey, or boulter. I sat and watched, and occasionally asked a question. Let me give you the results of my inquiries.

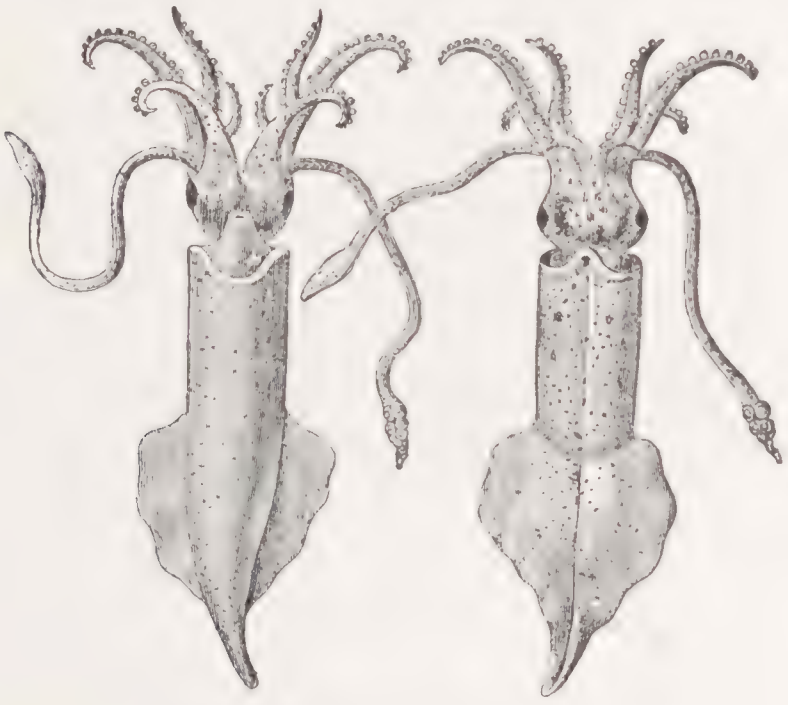
First, let me ask the intelligent compositor to help me by setting up a diagram:

Continue in imagination the horizontal line with the vertical hooked lines dependent from it at equal distances apart, and you have the idea of the boulter. This is of variable length, but in this instance Joe and Will had each contributed a portion, and the two

were united, the combined line being 2,700 feet long. To this three hundred hooks were attached, each with its own "stropping." The strop is a bundle of half a dozen short pieces of line, lashed together, and attached to the big hook. This work requires to be very carefully and neatly done, for when the conger has taken the baited hook into his throat, his jaws close upon this part, and bad work probably means the severing of the strop, and the loss of fish and hook. These strops and the double line connecting each with the boulter are about $2\frac{1}{2}$ feet long, and are attached to the long line at regular intervals of 9 feet, which allows one conger to be hauled into the boat and dispatched whilst the next is still in the water.

It seemed an endless task to bait these three hundred hooks, and the squid would not serve for all, so some were baited with pieces of pilchard; but the supply of this gave out, too, soon. As the hooks were baited, the line was coiled in a special manner in the stern, to prevent the hooks fouling each other when the boulter was "shut." All the available bait having been used up, we rowed out to sea, and about a mile down the coast, with lines baited with pilchard, in order to catch squid. This, of itself, was an interesting bit of sport, of which I must give a very brief

outline description. The line is not weighted, the baited hook floating on the surface. It is not there long before a tug is felt on the line—a peculiar tug which tells you a squid is there, and not a fish. Now, instead of the steady and rapid hauling-in necessary to land a fish, you require to draw in your line very



Squid : upper and under sides.

softly, so that the cuttle does not take alarm ; for he simply holds the bait in his sucker-covered tentacles, whilst he devours it with his beak-like mouth. He does not take the hook, and can therefore quit his hold, and retire swiftly on the slightest alarm. But the fisherman is prepared with a long thin bamboo

rod, from the end of which half a dozen hooks radiate, and with this he gaffs the cuttle, taking care so to work it that the squid's back is turned towards the boat: a wise precaution, as we soon see. The squid is hooked, there is a rushing sound as of a small rocket being fired—"si—ish!"—and the squid has squirted out the contents of a bag of ink he carries in the innermost part of his organization. A novice at the game usually has his face well inked before he learns the trick of so manipulating the creature that the jet of ink goes harmlessly into the sea. It is almost impossible to handle squid without getting terribly messed with this ink, which causes much smarting where it comes in contact with human skin.

My friends catch a few squid, and I amuse myself with a plummet line, baited with squid, trying to catch "chad," as the immature sea-bream is called. I have not been able to let my line down half-way to the bottom before a violent pulling satisfies me that a stronger fish than chad has taken the hook. A rapid haul of the line, and a gleaming bar of pink-tinged silver and blue is hauled aboard. It is a fair-sized mackerel, which is soon followed by several chads and a small pollack. But it is now getting dark, and the squids are shy, so my friends, fearing they will

not be able to bait all their hooks, determine they will have pilchards for the purpose.

The pilchard "drivers" are up in Gerrans Bay, and as their lights are now twinkling, it is a sign they have begun to haul their drift-nets. So we row to the nearest of them, which is about three miles to the north, and come up just as two other conger boats arrive on the same errand. Finding this driver has not yet hauled, though about to do so, we row on to the next. The enormous length of net is being drawn up over the side of the lugger, and by the light of the lantern I see the silver pilchards sparkling in the meshes. Many of them drop into the sea again as the net is hauled, but a company of gulls, swimming near the net, soon make short work of these, their perquisites. Will boards the driver, and is told that we can have bait, but fish is scarce, and the price has gone up a bit that day at Falmouth. We take a hundred and a half, which cost 2s., and row off again. Now the pilchards are cut up, the smaller ones into two, the larger into three portions, and with these pieces the remainder of the hooks are baited. We find the proper sea marks, and get on the right ground.

Then Joe stands up in the stern, and throws over

The pilchard "drivers."

the buoy. This is built up of large corks with a stick through the middle, from the upper end of which floats a red flag, and to which also a little tinkling bell is attached. One end of the boulter is attached to this buoy, and at a considerable distance from it the line is weighted with a heavy stone to keep the business portion deeply submerged, in fact so that the baited hooks lie upon the bottom. Then follows the whole length of the boulter, with the stropped hooks hanging from it; and finally, when the last one has been "shut," another stone and buoy are thrown over, but held attached to the boat.

That business so far accomplished, we have to give the congers time to find out and swallow the bait. They have a weakness for cuttle, and cannot pass it untasted. It wants now a quarter to ten o'clock, and we must allow the congers an hour's enjoyment before disturbing them. We occupy the interval by all fishing for chads, and have fair success. To a townsman used to well-lighted streets, the idea of this night spent on the dark, open sea, in a seventeen-feet boat, would be one of tedium; but to me it was full of interest. Looking over the side of the boat I saw gleams of phosphorescent light, or "briming," as some luminous creature scuttled down my line. Then a

great mass of silvery light appears far in the depths below, and rushes, comet-like, through the water. It is a fish that has come like a meteor within range of vision, but at too great a depth for me to mark its shape. It is a mere nebulous patch. You can, however, distinguish between a flat and an ordinary-shaped fish by the body of light, and a small conger will cause a very long and narrow streamer. When you have hooked a fish and hauled him within a foot or two of the surface, he makes a very pretty demonstration, and when he leaves the water it is amid a fountain of pearls. But now Joe rouses me to the business on hand by inquiring about the time of night, and finding the boulter has been down over the hour, declares it is time to haul. Up to this time we have worked entirely by the light of the stars, and the moon being in the west will not rise over the land until midnight; the candle is now lighted in the lantern that we may see what Joe is about. Having put on his "oilers" to keep off the wet, he begins to haul.

Taking the buoy on board, he hauls up the stone and then the boulter. A few hooks come up bare; the bait has gone; then there comes up one with a conger about four feet long upon it. Seizing the

strop, Joe slings the conger round his head and brings its body with great force upon the edge of the "room" or compartment of the boat specially reserved for the fish. By this means its back is broken, and its power for mischief is gone; for the conger is a savage fish, and snaps at the fisherman like an angry dog. Like a dog, too, it barks. The hook is extracted, sometimes with difficulty, the fish having to be cut open for some distance in order to get at it. In the case of a very large fish, whose market value would be depreciated by cutting it, the hook is sacrificed and separated from the boulter.

Hook succeeds hook as Joe continues to haul, some bare, some occupied by a large or a small conger; then one to which a Jack crab clings tightly, not willing to cut short the banquet he is having, though liberty can be obtained in his case by simply opening his pincers. The next hook brings up a twelve-pound pollack, then comes a conger of about twenty pounds, bare hooks again, then a large rockling. And so the business proceeds until the tinkling of a tiny bell informs us we have reached the buoy and the other end of the boulter. The result of this first shoot is twenty-five conger, weighing something like sixty or seventy pounds, a pollack or two, a crab, and a rockling.

Hook by hook the boulter is now overhauled, and rebaited where necessary; then shot again in a different direction. This accomplished, it is felt that we are deserving of some refreshment, and some ready-made cocoa is poured into the kettle from a stone bottle, made hot over an oil-stove, poured into cups, and drunk to the accompaniment of pasties or sandwiches. That important item finished, we do a little more line-fishing, and in the intervals between bites I amuse myself by glancing around at the semi-darkness. The stars and planets shine brightly from a clear sky, the most brilliant of them making long zigzag reflections on the sea. We are about a mile from the shore, and the high cliffs look but a low undulating bank. Away to the north the two great headlands are merged into one, about which twinkle the lights of many pilchard drivers. At an equal distance southwards there is a similar but greater display of lights from another fleet of drivers, and here and there around us are the lights of other conger-catchers. I am struck by the distinctness of sounds. The bleat of the sheep or the gentle lowing of cows in the fields comes to us very plainly, as well as the continual grind of surf and shingle on some of the beaches. Half a mile or more away one of our

congering friends is hauling, as we can tell by the sharp sound that testifies to his having stropped a conger on his boat.

A higher light than we carry is coming towards us silently, and, keeping my eyes upon it, I see the shadowy form of a pilchard driver emerge from the darkness close to us, with all sails set, and apparently bearing straight down upon us. She passes to leeward, however, and her light is soon lost in the crowd up north. The moon rises over the land, and Joe inquires again about the time. The boulter had been shut long enough, so we prepare again to haul.

Ay, but it was a sorry lot. Hook after hook came up, not merely without a conger, but without a vestige of bait. Here and there was a conger, a pollack, a bib, or a dog-fish, but it was clear that something else had been busy before the congers had a chance, and had picked the hooks clean. At least so it appeared to me, and I asked for Joe's opinion.

"There's not enough movement of the tide," he explained, "to rouse the conger from their holes, and the chads have cleaned off the bait. The sea is too still."

As if in support of this view, the next hook came

up with a chad upon it. A conger-hook is so large that it is impossible for any but a big fish to take it. But this impudent chad had tried it, and had got the barbed point fixed in his throat. At length—all too soon—we got to the buoy with the flag and bell. I had been keeping count of the conger as Joe stropped them, and felt sorry to have to tell him there were but fourteen, some of them rather small. Joe was a bit disheartened; he was tired, he said, and it was really not worth the trouble to bait three hundred hooks for such miserable results. We sought to cheer him up, and the hooks were baited afresh. I do not think there were half a dozen that did not require re-baiting. It was a long job, but steady industry conquered it, and at three o'clock we sought fresh ground and shot the boulter a third time.

How little dreams the dweller in an inland town, when he complains of the scarcity or high price of fish, of the patient endurance, the disappointments and losses of the fisherman, to say nothing of the dangers he has to encounter. I have known the men to go out toiling night after night, and return with so slight a catch that it would not even pay for the bait used in catching it. And sometimes a sudden storm will sweep away trammels, or other nets, and strings

of crab-pots. These are not insured, and the loss falls entirely upon the poor fisherman.

Having shot the boulter, we determined to cast off from it, and go in pursuit of squid to serve as bait for the next night. We set free the smaller buoy and rowed a mile or so away. Scarcely had we set to work fishing when Will bade us listen. We let the boat drift, and sat listening to a roar and rattle as of breakers rolling rocks and shingle on a shore where we knew there was no shore for a hundred miles. Around us the sea was perfectly calm, the surface scarcely rippled, and the air was almost still; but Joe said the noise we heard was the wind far out at sea, and we should probably get a tumble shortly—we had better look to our boulter. So we rowed down along again and looked for our marks. But before we could reach the near end of the line, the sea had begun to come in with a heavy swell and considerable waves, so that it was difficult to see any floating marks in the uncertain light.

Now the eastern horizon began to warm into pinky streaks, and a pale yellowness spread up the sky beyond the dark purple bars of cloud, and turned to richer and richer gold, until at last where the first faint colour had appeared it was now an intense fiery

crimson. The sea beneath was a sea of blood, but nearer it was molten gold, yet nearer silver, and still nearer white and gray. It was an hour before the sun peeped over the horizon, but the stiff breeze came and big seas broke around us. Some fellow-congerers drifted near us, and we saw they were catching squid, so we also caught a few. Then between us and the dawn-glow we got a glimpse of our bell-buoy. We could not yet hear the tinkle of the bell, but there was the drenched flag hanging from its staff.

As the boulter had now been "shut" a couple of hours, we elected to haul for the third and last time, and go home to breakfast. How glad we were that we had not given up after that last rebuff! When Joe put on his "oilers" and hauled again there were plenty of unprofitable hooks brought to light, but thirty-four held fair-sized congers—a few of that number were large, thirty or forty pounders, and one a few pounds heavier than that—with several big pollack, a ray, a scad or horse-mackerel, a crab, and several worthless dogs. The heavy sea had done the business for us by waking up the congers and showing them our attractive bait, so that our third haul in point of weight was equal to the other two combined.

We returned to port with a good "room" of fish, weighing upwards of two and a half hundredweight. These were heaved out upon the rocks and packed into hampers, which were sent to Falmouth by steamer a little later.

I have briefly summarized the catches, without giving many details. There were, however, a few incidents that might be recorded but for fear of making this chapter too long. Many wonderful stories are told about the conger, which takes the place in narratives of sea-fishing that is occupied by the Jack in the yarns of the fresh-water angler. But the wildest estimates of the size and weight of the Jack that got away will not compare with the well-authenticated weights and measurements of the conger that have been actually caught and brought ashore; though it must be admitted that even here it is always the very large fish that get away. The late Mr. Mathias Dunn of Mevagissey gives particulars of a catch which included three specimens weighing one hundred and twelve, seventy, and sixty pounds respectively. Fifty-pounders are by no means uncommon, though they have a trick, when hooked to the steelyard, of only registering about forty-two pounds; but this is probably due to a defect in the weighing instrument!

One of our specimens when brought to the surface was found to be surrounded by a very big fellow, who had all but entirely swallowed the smaller one, but had the good sense to take her teeth out of her prey and slip off as Joe attempted to haul her on board. The smaller specimen—a male—was scored with scratches from the big female's teeth. In several cases the conger had the line tied tightly round his body, and was thus doubly secured. This he had done in his efforts to pull the hook out of his own throat. They have the power of setting up a *revolving* motion of the body upon its own axis, and by this means they coil the short line up into a tight ball, which so shortens it that the hook gets pulled from the conger's flesh. Often when one has been disabled and thrown into the room, he has sufficient vitality left to rush around it and seek with his tail for a crevice that may offer a chance of escape or concealment. He will as frequently make a grab at a smaller specimen the fisherman is holding over the "room" as he extracts the hook. It would be anything but cheering to a person of nervous disposition to sit at night in the boat and see these monsters rushing about the room, barking, coughing, and yawning. Those we caught, being chiefly from the rocks, were mostly blackish on the

upper surface, white beneath: where they are taken from a sandy bottom they are whitish-gray or cream-coloured. It is said that digestion is so rapid in the conger that a hook left within one very soon becomes entirely corroded.

VI.

HERMITS AND THEIR FRIENDS.

ONE of the most interesting of the phenomena of natural history is that to which modern science has applied the term commensalism. Generation after generation, creatures far removed from each other in the tables of affinity agree to become messmates, and attach themselves in many cases for life. Many instances are now known, some of them of an exceedingly intimate character, like that of the little Pea Crab (*Pinnotheres*), which is almost always found in the shell of the mussel or some other bivalve mollusk. This particular case, it is true, is no modern discovery, for it was familiar to such writers of antiquity as Pliny, Oppian, Aristotle, and others, though instead of seeking to understand the reason for the partnership by experiment and observation, they invented a number of absurd romances to account for

it. One of these stories represented the minute crab as waiting with a pebble in his hand until the *Pinna* (a species much affected by the Pea Crab) should open its doors, when, like the modern tramp who slips his foot in a partly-open door to prevent its closing before he gets his backsheesh, the *Pinnotheres* would jam

Pea Crab.

his stone between the valves of the shell, and, climbing in, would eat up the *Pinna* at leisure. Another version was much nearer the truth in attributing a business arrangement as the basis of the partnership, though the details are probably not in accordance with the facts of the case. According to this

second story there is an understanding between the partners that the *Pinna* should lie with its shell widely extended until some little fish, impelled by curiosity, should venture within, when the crab would give the mollusk a gentle nip, a signal for closing the doors with a snap and imprisoning the fish, upon which the conspirators would then dine. It may be said that until naturalists succeed in ascertaining the actual facts of the case these stories are entitled to stand, on the principle of a poor explanation being better than none; but science rightly refuses to admit theories that are opposed to probability unless they have some facts to support them. Probably the currents set up by the *Pinna* to bring food and oxygen to it also convey something suitable for the crab's sustenance; and the *Pinnotheres*, by his crab-like uneasiness when danger looms, may warn the mollusk that it is time to close the valves. This ancient problem must be left just now, for my immediate business is to consider the relations between the Hermit Crabs and certain other creatures.

The Hermits or Soldier Crabs (*Paguridæ*) are a tolerably numerous group, of which no less than eleven species are to be found around the British Islands. Into their names and specific distinctions it

is scarcely necessary now to go, as this present writing does not presume to be a monograph of the family. The most striking feature of the Hermit's personal appearance, after dragging him from his portable hermitage, is the contrast between the stout crust around his limbs and the parchmenty consistency of the integuments surrounding his "chest," the elementary condition of his fourth and fifth pairs of limbs, and the naked softness of his twisted "tail" or *pleon*. It is a moot point whether this unprotected condition of the hinder portion of these crabs has been produced by the habit of hiding it within the shells of mollusks, or whether the habit has been adopted as a necessary consequence of the niggardliness of Nature in providing the Hermit's outfit. This point may not be settled at present, but I am inclined to take the view that the soft pleon came first and the mollusk's shell was borrowed as a real protection. The celebrated Cocoa-nut Crab (*Birgus latro*) of Keeling Island is of similar structure to the Hermit Crabs, and was at one time included in the same family; but its broad pleon is not twisted, and is protected by dorsal plates of horny or limy character. The original Hermit may have possessed protective plates of this character, but felt that a

whelk-shell would afford more satisfactory defensive works; for if he could pull himself well into the doorway he could utilize his bigger pincer-claw as a street door, and thus effectually keep out intruders. If that were so, we can imagine that there was a constant striving to make the pleon curl round and fit the spiral shell. The individuals that could best accomplish this would be those to whom the shell afforded the greatest security, and therefore these would be the most likely to live and transmit a curl-tailed progeny. Colour is given to this supposition by the fact that these Hermits begin life as symmetrical animals; but they soon get the curl in the tail and lose their symmetry, for they have been found with borrowed shells when only one-eighth of an inch in length.

Until the Hermits are about an inch long in the trunk, they may be found in abundance on the shore at low-water or in the rock pools; but after attaining to this size they appear to have some difficulty in finding their food inshore, for larger specimens are only to be obtained from deeper water.

How the Hermits obtain possession of these shells is also a moot point. The name of Soldier Crab has been applied to them from a belief that they attack

and capture the castles of other warriors. They do undoubtedly try to obtain a desirable shell they know their brother to possess, and in the narrow bounds of an aquarium they waste a considerable amount of time in dodging each other, one seeking to take advantage of the other, and he doing his best to protect his own property. But they so rapidly spring back into the shell on the slightest alarm that it is very difficult for one to get the better of another. That they do contrive at times to accomplish their end I can testify from living specimens in my possession. I have not actually seen the transfer, and therefore cannot say whether it was accomplished by sheer brute force, by diplomacy, or by fair bargaining; but I have seen the dispossessed Soldier vainly trying to get into a shell that was a couple of sizes too small for him, whilst the other had some little difficulty in hauling about the shell that was too roomy for his immediate requirements. I am very sceptical as to their killing and evicting whelks from their shells. The late Professor Bell, in his "History of British Stalk-eyed Crustacea," believed this "to be true in many if not in most cases; certainly, however, not in all." He further says, "It can scarcely be doubted.....that

it often obtains its habitation by violence. The fishermen on the coast are fully persuaded of this; and an intelligent person of this class at Bognor assured me that the fact has often been observed by himself and others. He stated that the aggressor seizes its victim—the whelk, for instance—immediately behind the head, and thus kills or disables it, then eats it, and finally creeps into and appropriates its vacant shell."

Bell was a trifle too partial to the evidence of fishermen upon matters in which they take little or no interest, and I cannot help thinking his book would have become more permanently valuable if it had contained more records of personal observation and fewer of such stories. To those acquainted with the structure and ways of mollusks the story is not very convincing. A whelk before it is cooked has very soft flesh, and is very quick in withdrawing into its shell and closing the opening with its horny operculum; and the probability is that before the crab had managed to secure a firm hold of the whelk, the soft body of the latter would be drawn through the crab's pincers and safely housed. Even should the crab succeed in thus killing the whelk, to clear it out of the shell is an impossibility; for, as

every conchologist knows, the whelk has muscular attachment to the shell, and this attachment is not easily broken, save by cooking or decomposition, so that those non-muscular portions towards the apex of the shell must remain to putrefy. The crab would, therefore, be unable to make immediate use

Hermit Crab and its Anemone Messmate.

of the shell, and consequently is not likely to go to such trouble to obtain a house where desirable empty shells of all sizes are lying around.

After several changes of his natural shell, as is customary with all crabs, our Hermit we may suppose is snugly housed in a full-sized whelk-shell.

His body is now about five inches long and the hinder portion large and plump, by which token we know that he gets regular rations, and these of an abundant character. But as a rule we shall now find that, in addition to the cumbrous whelk-shell he has chosen to drag about, there is now perched up on the apex of it a great, pale-brown, solid-looking tower of flesh, three or four inches high, the summit crowned with a wide-spreading circlet of creamy-white tentacles, almost as broad as the column is high. This is the unfortunately-named Parasite Anemone (*Cribrina effœta*), which is a companion, a messmate, and not a mere sponging hanger-on. Whatever may be the whole truth of this remarkable association of these widely dissimilar organisms, it is fairly certain that it is not a case of parasitism: if the anemone benefits, we may feel sure that the Hermit does the same; and there is at least one point in which the Hermit feels the advantage in being the carrier of the anemone, for I am sure no fish, however hungry, would touch the Parasite as food. Most of the members of its class possess a very unpleasant odour, but in the Parasite it is particularly strong and objectionable, and he who handles the creature must use much soap before he can rid his flesh of the nauseous smell.

There is also the probability that the Hermit may get food dropped to him from the Parasite's table, for from his more elevated position and his rapid transit through the waters he may be enabled more easily to obtain tit-bits in the way of small fishes and other creatures. My neighbours, who are fishermen, catch plaice by means of a "spiller"—that is, a long line to which a large number of baited hooks are attached by shorter lines, the whole thing being laid on the sandy bottom, where plaice and other flats are known to congregate. Often when they take up these spillers they are annoyed to find that, instead of a good-sized plaice upon every hook, several of the baits have been sucked in by these huge anemones, which get hauled up with whelk-shell and Hermit attached.

There is one way in which, undoubtedly, the Parasite renders a service to the Hermit—that is, in lightening his load somewhat by reducing the thickness of the whelk-shell. This is a fact I have had many opportunities for testing. Where the Parasite stands, the shell becomes very thin, so that the light comes through it and the natural ridges of the shell are obliterated or much rubbed down. Between the anemone's base and the thinned shell

there are now several layers of a thin brown-papery substance which, without analysis, I take to be the animal portion of the shell from which the calcium carbonate has been dissolved out by means of some acid excretion from the Parasite's base. When it is considered that often as many as four of the Parasites may be crowded together on one whelk-shell, it will be understood that the thinning process must be considerable. Even where there is only one of the anemones, it will be found that he is frequently shifting his perch, and so the thinning goes on slowly and irregularly all over the surface. This observation I will support presently by one of similar import.

That the selection of the Hermit's cell as a coign of vantage by the Parasite is no matter of accident, constantly recurring, is sufficiently attested by the fact that when the Hermit dies or is about to die and quits his cell, the Parasite has no further desire for his perch; he quits his hold and attaches himself to a rock or some other base firmer than an unstable, empty whelk-shell. It is a remarkable thing that when the Hermit dies the Parasite is aware of the fact at once, and acts accordingly.

The Parasite is not the only partner in the firm of Bernhardus and Co. As a rule the other member

of the firm keeps behind the scenes. His name is *Nereis fucata*, and he is a beautiful marine worm, whose long, depressed body is built up of a great number of rings or somites (I have counted from 114 to 130 in different individuals), and each of these segments is provided at each side with a leaf-like horizontal gill, beneath which in each case

Common Hermit Crab and Worm Messmate.

are bunches of stiff bristles, apparently made of spun glass, which act either as oars or as pushing poles for locomotion. This worm lies in the upper whorls of the whelk-shell, but at times he comes out to take the air—or water—and rambles over the outside of the shell; that is, about seven inches of him comes outside, whilst about an inch of the tail end keeps up communication with the inside, and

affords the leverage by means of which the main body may rapidly get back into a secure place when danger threatens. Worms of this genus are splendid bait for fishing, so that the *Nereis* is much more secure in the Hermit's cell than when seeking to elude flat-fishes under sand and stones. It dwells in peace with the Hermit, and may frequently be seen protruding from the whelk-shell and creeping over its partner's head. Its presence in the Hermit's cell is explained, I think, by the fact that it acts as a scavenger, and clears up particles of food and excrement that would otherwise lodge in the apex of the shell and become offensive. But there is not the same personal attachment to the Hermit as characterizes the Parasite's partnership; for when the Hermit dies the worm still occupies the shell, and I have kept a *Nereis* under such conditions for six or seven months after the death of the Hermit, and even then the worm did not die a natural death, or pine away—it was in perfect health, but I desired its dead body and plunged it into spirit.

The same shell in which lived the last-mentioned *Nereis* had also, just inside the mouth, a colony of little white Hydras with very long, slender tentacles,

with which they captured more minute creatures. These Hydras were the larval forms of a species of jelly-fish. Then both inside and outside there was a great number of contorted tubes of several species of *Serpulæ*—another group of worms, which build for themselves pure white stony tunnels of polished lime in which they can lie secure, and from the mouth of which they cautiously thrust out their heads and unfold glorious spreading crowns of blue, gray, or scarlet rays, retracting them with a sudden snap should a shadow fall across them. Close beside these were acorn barnacles (*Balanus*), for ever opening their trap-like doors, and spreading out their crystal hands to grab a handful of the microscopic contents of the sea-water and take it into their mouths. Then there were many other creatures of a more minute character; and I used sometimes to smile as I thought how the ordinary seaside visitor would spurn a dirty-looking shell like that, though it was a little world in itself, inhabited by most wonderful and beautiful creatures.

The species we have been describing so far is the common Hermit Crab (*Eupagurus bernhardus*), but there is another species of less robust appearance called Prideaux's Hermit Crab (*Eupagurus prideaux*),

which was confused with the common species until Prideaux took a number of specimens in Plymouth Sound and sent them to Dr. Leach, by whom the species was named after the industrious friend who had supplied him with so many good things. It is not necessary in a popular work to go minutely into the points of difference between these two species, but I may say in a few words that *E. bernhardus* has its

Prideaux's Hermit Crab.

limbs covered with little tubercles that exhibit a tendency to develop into spines, that its upper crust (what there is of it) has a small "median projection" between the eye-stalks, and that the terminal joints of its second and third pairs of limbs have an evident twist, with spinous upper edges. In *E. prideaux* the limbs are simply covered with low rounded granulations with a few tubercles, the

"median projection" is wanting, the limbs have but the faintest suspicion of a twist, with deep grooves and nearly smooth edges. Then, size for size, the pleon of *E. prideaux* is much more slender, and I think less curly. But there is another point upon which I desire to lay stress, and that is the difference in the messmates. The Parasite does not perch upon the shell tenanted by *Prideaux*, but its place is taken by another anemone, to which Gosse gave the popular name of Cloaklet (*Adamsia palliata*), because of its habit of completely investing the shell with its body as with a mantle. This species of Hermit is usually found tenanting the shell of the Painted Top (*Trochus magus*), which is boldly sculptured, and painted with irregular purplish streaks, mostly running obliquely across the shell. It is at least remarkable that the *Adamsia* is marked with a very similar pattern and in the same tints. The reduction of the whelk-shell by the Parasite is emulated in more thorough fashion by the Cloaklet, which renders the entire thick and heavy Top-shell thin and soft, so that the crabbers, who find both species in their pots at times, distinguish these as Soft-shelled Hermits. Quite recently I had a couple of living specimens brought to me which had

been found living in holes in the rocks. I do not know if a similar fact has been recorded, but I have not yet heard of such. These specimens were not ensconced in molluscan shells, neither were they invested by the Cloaklet; but to me they have far greater interest than the normally disguised forms by reason of the additional light they cast upon this group of crabs. In the various spider crabs, we have seen there is a great tendency to dress up in order to disguise their natural appearance and deceive their natural enemies; and it may yet turn out that *E. bernhardus* and *E. prideaux* respectively look for young specimens of their favourite anemone and plant them on their borrowed shells, just as *Maia squinado* and other sea-spiders are known to plant sponges and zoophytes on their carapaces. But this thing is certain, that by some means not yet ascertained *E. prideaux* can induce a colony of the acorn barnacle to take up a commanding position on its carapace, and so help it to fill up an inconveniently large doorway to its hole in the rock. Crabs of the more ordinary type of structure that live in holes always resist eviction by pressing their backs against the roof, and appear to know full well that if their enemy can only get behind them they are bound

to clear out. How does the Hermit that normally lives in shells know this important fact? This is a matter that requires further investigation.

Of course, an isolated instance of this kind, though

Thompson's Hermit Crab.

interesting, would have little value; but in this case there are two specimens, living under similar conditions, decorated in absolutely the same fashion. How they happened to take to living in rock-holes

is, I think, pretty clear, and affords evidence of the resourcefulness of the Hermits. The place where these individuals were found is used by the fishermen for landing, and mooring their boats. Hermits minus cells frequently come in with the boats, having fallen from crab-pots, spiller-lines, nets, etc. These two were thrown over into the "porth" when the boats were cleaned out, and finding no shells they were compelled to seek shelter in the rock-holes, which were too roomy for them. Acorn barnacles in the larval condition rapidly cover all submerged surfaces between tide-marks, and crabs have to keep themselves well brushed to be rid of them. Now, the idea seems to have occurred to two crabs, living in separate holes and unable to communicate, that by not brushing their heads and certain parts of their legs they could have a growth that would speedily fill up the inconvenient space around them, and keep them in safety.

VII.

CRABS THAT SWIM.

THE reader whose observations of crab-structure have been restricted to the heavy-bodied, thick, and hairy-limbed creature that the fishmonger supplies for our table would be justified in regarding the swimming power as one of the least likely to belong to the crab. As a matter of fact, nearly every kind of crab begins life as a swimmer, and discards that method of locomotion at a very early age; but in some that have attained to adult form and proportions the swimming capacity has not only been retained, but greatly developed. The truth is that the crab type of structure is susceptible of almost indefinite variation to fit the animal for widely differing habits of life.

We all know how the backboned type of structure in the higher groups of animals has been modified

so that the fore-limb has become the arm of a man, the leg of a horse, the flapper of a whale, the wing of a bird, or the fin of a fish. Even in a more restricted class—the mammals—we see great differences in the shapes and uses of the extremity of the same limb, forming the hand of the monkey, the umbrella-like false wing of the bat, the clawed and padded five short toes of the cats, the three-toed foot of the rhinoceros, the two-toed hoof of the ox and deer, the broad single-toed hoof of the horse, and the massive pillar-like foot of the elephant. All these are but special modifications of the same skeletal type.

Seeking for examples of this kind of adaptation of structure to habit among the larger Crustacea, we find that the broader-than-long body of the edible crab becomes the much longer-than-broad body of the lobster; that the rounded, bristly limbs become in the spider crabs drawn out to great length and slenderness, and in the swimming crabs flattened out into broad blades for propelling them through the waters. But the modification does not begin and end with the limbs. For every change in these there is a corresponding variation in the general body form and in the size and mounting of the eyes. The body may become round or triangular, the shelly covering

thick or thin, corrugated, thorny, velvety, or perfectly smooth. Every one of these variations, slight as it may be, is correlated with some difference of habit in that particular species. It is impossible in the limits of a brief paper to range over the crab-world, and to show in a convincing way the correctness

Common Shore or Harbour Crab (Carcinus mœnas).

of this statement; but by confining our remarks to the native representatives of one little group, we may hope within narrow compass to achieve that end. We shall therefore consider the British members of the family *Portunidæ* of the zoologist, or, as we may here call them, the Swimming Crabs.

The crab that is most widely known in the living

state in these islands is undoubtedly the greenish Shore or Harbour Crab (*Carcinus mœnas*), the agile scavenger that may be seen on all our shores, to the delight of all juvenile visitors to the coast. It is not actually a swimming crab, but in general structure it is very near them, and suggests to the observer the archetype from which by slight modification the swimming crabs might have been developed. In the tropics there are crabs that spend nearly the whole of their lives on land at some distance from the sea. We have none such here; but the shore crab is the nearest approach to them, being the most amphibious of our native species, and spending much of its time, between tides, racing along the shores in harbour searching for garbage. Whether above or below water the shore crab is equally a runner, tiptoeing, spider-wise, on the points of his eight smaller legs, and carrying the two heavy nipper-arms flexed under the front of his shell.

Under water on a sandy bottom this crab can bury itself very quickly. The tips of the legs are thrust backwards and downwards until they reach the more compact layers of sand, then they are curved to get a better hold, whilst the body—wedge-shaped behind—is pulled down in a slanting direction until

only the sharp front edge of the shell is left uncovered. Above this the stalked eyes can watch all that goes on along the bottom in all directions. Should anything happen that warrants activity, the crab readily frees itself from the sand and runs to the spot, where perhaps a fish has fallen dead or wounded from the upper waters, or a fisherman's baited hook has descended. A minute ago not a crab was to be seen on the bottom; now they rise from all quarters, converging on the fish and fighting for the best bits, breaking off or crushing the limbs of their more successful rivals. If a baited hook lies on the bottom it is very soon cleared of the bait; but if it dangles a few feet above, the shore crab may only gaze longingly up to it. The swimming crabs here have the advantage; with a few strokes of their propellers they can mount through the waters to the desired tit-bit.

Glancing at this portrait of the shore crab, and considering it point by point in the light of what we know of its habits, we can gather some ideas upon the adaptation of structure to mode of life that will bear application to the structure of other crabs whose habits we may not know so well. It will be noticed that the trunk is narrower behind

than in front—roughly one half of its greatest length—an important modification in view of its wonted backward burrowing. Then the four pairs of smaller limbs all end in sharp hard points that rapidly enter the ground. These limbs are also flattened from the sides, and their under edges are much thinner than the upper ones, a character that helps to the same end. The two last joints of the hindmost pair of limbs are much more flattened than the others, and it is for this reason that I associate the shore crab with the swimming crabs, although it is no swimmer. If it were possible to flatten out these joints to a greater extent, they would become paddles, and could doubtless be used by the crab for more or less effective swimming feats.

Now look at a specimen of the Long-legged Swimmer (*Bathynectes longipes*), and you will see that whilst the limbs have been made relatively longer and thinner, these terminal joints, though ending in very sharp points, have been much flattened out. This species does not appear to be much of a swimmer. It is a deep-water crab, spending its leisure embedded up to the eyes in coarse sand at the bottom where all the seaweeds are crimson: hence, doubtless, the dark crimson or red-brown of

its upper surface. Upon the advent of anything in the nature of food it quickly frees itself from the sand, and paddles up through the water to sample it. It should be noted that, to overcome the obvious danger of weakening these terminal joints by flattening the material, strengthening ribs run from end to end, and give the requisite stiffness to them. To increase

Wrinkled Swimming Crab (Portunus corrugatus).

further their efficiency as paddles without adding to their weight, a close fringe of stiff hairs is set all round their edges.

The Arch-fronted Swimmer (*Portunus arcuatus*) is very like the shore crab at a glance; but the front of the shell, instead of having two rounded notches between the eyes, has a convex margin, and the

hinder feet are converted into slender paddles. The other limbs are much like those of the shore crab, with which it is found on oyster-banks.

The Wrinkled Crab (*Portunus corrugatus*), so far as its swimming equipment is concerned, is much on a par with the last named; but, as its names indicate, its entire upper surfaces are marked by transverse ribs. It is mottled with dark crimson, dirty white, and a little purple, and covered with short brown hairs. It is anything but common, owing, I believe, to its habitat being in tolerably deep water where the red weeds grow, and where, no doubt, its colouring and sculpture help to disguise it.

The Marbled Swimmer (*Portunus holsatus*) is a larger species equally affecting deep water, but coming to the surface in pursuit of fishes. It is never seen on shore unless its dead body has been cast up by storms, or living individuals have been hauled in by the ground-seans. There is an advance in the development of the paddles in this species. They are broader, and to increase their power they are well fringed with hairs, whilst the body-shell is thin and well polished, free from hairs or wrinkles. The whole aspect of the crab indicates lightness and agility. Two forms of it have been recognized by

some authors as distinct species, but careful examination and comparison of considerable numbers leads me to the conclusion that these are merely extremes in a series of many gradations, chiefly due to adaptation to their surroundings. The normal form is greenish-gray minutely mottled with white and pale buff, whilst in others the ground colour is

Marbled Swimming Crab (*Portunus holsatus*).

brown or dark red with the same mottling of white and buff, occasionally with a dark red club-shaped mark in the centre of the back. When the crab is at rest waiting for its meals to come within sight it partially buries itself in the sand, leaving the upper part of its back uncovered, when it harmonizes wonderfully with the sand. In truth, as you gaze at

the shell you can see the grains of sand and the larger rounded particles of felspar faithfully reproduced there.

A more familiar species is the Mary Crab, Lady Crab, or Cleanser (*Portunus depurator*), which finds its way into some markets as food. It is a crab

Lady Crab (*Portunus depurator*).

of neat, even graceful, proportions and of pleasing pinkish coloration. This is the most common of our native swimmers, but it is only taken at some distance from the shore in deep water, chiefly in the fishermen's nets, where it goes to pick the bones of the fish that have got enmeshed. Such a habit, it need scarcely be said, does not dispose the fishermen to

appreciate its beauty. The paddles are well developed, and the crab is consequently a good swimmer. But the most highly organized of our native species for this purpose is Henslow's Swimmer (*Polybius henslowii*), known to Cornish fishermen as the Nipper,

Henslow's Swimming Crab (*Polybius henslowii*).

from its habit of following the schools of mackerel, herring, and pilchards, fastening upon the fishes, and attacking them with its pincers. The shell of this crab is exceedingly thin and glass-like, more nearly round than that of the other kinds, coloured a steely-

blue with purple margins—a coloration that probably makes it less conspicuous among the blue-backed fishes. Not only are the hindmost limbs turned into powerful paddles, but all the legs except the pincers are to a less extent flattened and fringed, so that it can bring them all into play. Fishermen on our south-western coasts credit it with such high powers of swimming that they assert it successfully pursues the swiftest of fishes, but this is scarcely probable. What is certainly true is that it gets among the schools, and no doubt there finds plenty of victims. The fish on their part appear to be well aware of its murderous propensities, and retaliate by attacking it. From large numbers taken from the nets I have experienced difficulty in getting perfect specimens. Most of them have had half a paddle bitten clean off, and many of them show teeth-marks across their backs. The one photographed for this illustration had the misfortune at an earlier period to lose its left nipper in this way, and had grown another; but, as will be seen, this had not nearly attained to the size of the right and the original.

Another deep-water species is the Dwarf Swimmer (*Portunus pusillus*), which I have not figured, on account of its small size. It appears to be fond of

haunting the floating corks by means of which the crabbers indicate the position of their crab-pots below, and here it preys upon the variety of small creatures that are always to be found there.

Our last example is from the other end of the scale of magnitude, a rather heavily built and highly pugnacious crab known as the Velvet Fiddler (*Portunus puber*). This fine fellow—he is really extremely handsome—may be found lurking under big stones at low water, and the crabbers too frequently find him in their crab-pots, where he rapidly demolishes their bait, and so reduces the chances of attracting the attention of the marketable Jack Crab they desire to find there. The Fiddler mostly pays the penalty for intrusion by being stabbed by a thole.

Velvet Fiddler Crab (Portunus puber).

His back is covered with velvet, and his limbs partially so, picked out with polished bands of blue-black. The heavy nippers are streaked with light blue and white, and studded with polished white bosses, the joints of all the limbs connected by bright crimson parchment hinges, and the large, prominent eyes are gleaming rubies. As you turn over the small rock under which he is awaiting the flood tide, the Velvet Fiddler at once assumes an erect attitude, and holds up his nippers with an air that is an eloquent challenge to a combat. All the joints of the hindmost pair of legs are flattened out, strengthened by central and marginal bands, and fringed with stiff golden hairs. The final joint ends in a sharp, tapering point.

The character of this last joint in all the species helps us to understand something of the habits of the individual. The broader, more rounded tip belongs to those crabs that partially bury themselves in fine sand; those with pointed tips have to dig in firmer, rougher ground; and where—as in the Velvet Fiddler — they have stiffening bands and spinous tips, still harder ground is dealt with. This habit of hiding is essential to animals so highly esteemed as food by the majority of the larger fishes, and to it the whole of this group of crabs owe

their particular form and ornamentation. Glance over these illustrations again, and you will note that every species figured has the front edge of the shell, outside the eye-orbits, embellished with sharp-pointed triangular lobes like the teeth of a coarse saw, five on each side. To most persons these are mere meaningless ornaments, placed there because the crab would look strange without them. But there are many kinds of crab not so decorated, and their habits differ from those of the Swimmers.

Then, again, there are certain spines on the nipper limbs, and long hairs on the upper edge of the next three pairs of legs as well as on the sides of the shell. Now, if you set one of these crabs in an aquarium whose floor is coated with a few inches of sand, you will find that at some time or other he will bury himself in the sand, all but his eyes and antennæ, which will keep watch along the bottom; the eyes erected on their stalks, the antennæ vibrating to transmit various sensations from the waters. The nippers have been folded in front of the mouth, and the other limbs packed as closely as possible to the sides.

Now, beneath that shell on either side the crab keeps a set of gills, and when he incessantly works

the pair of great outer jaws that stand like double doors protecting the smaller cutting organs within, the movement also sets in motion fans within the gill-chambers, which in turn cause a current of water to flow under the lower edge of the shell into the chamber, over the gills, and out by the jaws. If a few grains of sand were to get under the edge of the shell and among those delicate gills they would doubtless inflict great damage; but if one or two grains could thus gain admission, the ever-flowing current would take in thousands of grains, and the blood-purifying machinery would be ruined. It is to prevent such a disaster that the shell bears those five teeth on each side and those hairs on its side walls; that the limbs pack up so closely to the shell and are crested with that fringe of hairs; that the nippers bear those spines.

The marginal teeth with their interspaces form a coarse sieve, holding up the grains of sand whilst allowing the water to pass between the shell and the flexed limbs. The hairs on the sides and legs serve a similar office below, whilst the spines on the nipper-limbs prevent these limbs from folding up *too* closely to the front of the shell, but allow just sufficient space to permit water to pass free

from grains of sand. Thus the crab has the treble advantage of lying protected from the observation of its enemies, it can keep a sharp look-out for its own food, and can breathe comfortably all the time; and when the moment for action arrives it has but to shake out its limbs and stand tiptoe to get rid of its sandy covering.

When you come across one of these crabs dead upon the shore, fold up its limbs close to its body and you will be surprised to find with what accuracy they fit, and how admirably they act with the marginal teeth to form this filter. There are in truth many more points of interest in the crab tribe than are suggested by a lunch-table study of the crab of commerce.

VIII.

A ROCKY SCRAMBLE.

WE had proposed to visit the breeding-places of some sea-birds on a craggy Cornish headland and an adjacent rocky islet, taking with us a couple of lads who knew the ground fairly well, but whose scholastic engagements prevented the expedition taking place on other days than Saturdays. We were to sail out from our village, Portscatho, on the first Saturday when there should be a favourable wind for sailing and a sea not too heavy for landing at the Gull Rock. Alas! though we made all our arrangements each Friday evening for a fair start next morning, for weeks it fell out that heavy seas rolled in on the Saturday mornings. We began to fear that all the eggs—of which we coveted a few specimens for our collection—would be hatched and the young birds fledged before we could get there.

It was slightly past the middle of May when our last arrangement of the kind was made. The sea had been tranquil all the week, and on Friday evening there was a nice breeze from the north-west —just the wind we desired. The next morning the wind had shifted to the north-east and increased in force, whilst great rollers came down the Channel and into our bay, breaking heavily on the Gull Rock The situation was growing desperate; but though we could not get to the rock, there was no reason why we should be further balked of our intention to visit the Nare Head, and clamber round its huge buttresses and shoulders. And so we resolved to walk all round our bay, by cliff-path, field-path, road, beach, and cliff-paths again, to the rough sloping moorland strewn with the great felspar masses which Tregeagle hurled there as quoits. Then down a steep turfy hill we slid rather than walked to a little stream that flowed under the hedge, and then, as the noise informed our ears, fell to some depth below.

We leaped the hedge and drank of the crystal waters that flowed over the mossy stones, then made our way down the face of the rock to a triangular cove below. In the acute angle was the silver

cascade falling and splashing the rocks with its spray, which hung like glittering jewels on every moss and fern. At the base of the triangle was the sea, bounded on either hand by the high walls of rock, in one of which is Tregeagle's hole, where in rough weather he may be heard howling under the lash of his hard taskmaster, who sets him such unprofitable work as bundling the sea-sand and weaving it into ropes.

It was from this point that our real scramble commenced. Climbing the straight face of the rocks to the east, we availed ourselves of little ledges that just afforded a hold for our toes, until we stood upon a narrow wall of rock that separated P'rada (spelt Penreda) Cove from a smaller cove next door, so to speak. Turning sharply round we got upon a steep bit of moor covered with the delicately fragrant pure gold masses of furze-bloom, through which we had to force our way. Then they became less dense, and all the ground between the bushes was deeply covered with the blue flowers of wild hyacinth, whose bruised stems were slimy to the tread, and made walking near the edge of the cliffs a dangerous business. A full-sized viper was disturbed, and it glided leisurely away. At length we came to

where we had a fairly clear view of a long stretch of the rock-wall towering up above and before us, and extending down sheer into the water far below, its base marked by a litter of great rocks that had dropped from above during the flight of ages.

A chorus of "Jack! Jack!" from a flock of glossy, black-coated birds told us we were over a colony of daws, and by crawling out over a buttress of rock we got down to a vantage-point whence we could see their holes in the solid cliff. A few feet below us on a narrow shelf were a couple of unfledged cormorants, and from a hole in the rock above we saw fly out four young ravens.

Up again and over another shoulder, where we got a peep of wide-stretching white sheets of ox-eye daisies sloping almost to sea from the high moor above. Here we found a jackdaw's nest, with young birds, about three feet down in a tunnel under a projecting rock. And now we climbed along with the narrowest ledges for foothold, the fingers clinging to any little projections from the wall to steady us over dangerous gaps. The slightest mistake, and a dull thud on the boulders beneath would have signified that one of us had stepped from time into eternity.

There is another buttress a little farther on, and from behind it we see cormorants flying back and forth. There are nests there. We go up and down, and down again, over smooth sloping rocks with very few irregularities against which to press the foot. However, we contrive to go down and round, and still hold on; and when we have turned the corner there are six or seven untidy apologies for nests on narrow ledges not much wider than this page, and in each nest are two awkward-looking, silent, gaunt, and unfledged cormorants.

We retrace our steps up to our main level, and again advance towards the Nare Head; but soon a lesser black-backed gull flies from a ledge above us, and we are bound to scramble up over the rocks to take a peep at her nest. It is a slight affair, chiefly composed of dry grass, and very shallow—just sufficient, in fact, to prevent the three olive, brown-blotched eggs rolling away. Down again a little, and now we have some awkward crawling under an overhanging block; then down we drop to a lower level, where we discover a rock-pipit's nest with four brown-spotted gray eggs. Our way is now barred by a steep, high pinnacle, up which we climb for seventy or eighty feet, and find ourselves

upon a grassy slope topped by a similar rocky height. This scaled, we have no further heights to climb—we are at the summit of the Nare Head, and all around and far below us is the blue sea. Away in a straight line more than half a mile due east rise the spires of the Gull Rock, its yellow slopes marked with long stripes of white where the birds have lime-washed the rocks. We can see the gulls sitting upon their eggs, as we suppose, and others flying around uttering their caterwauling cry. More to the north, but five and a half miles distant from us, runs out the gloomy Dodman Head, a huge mass of slate nearly four hundred feet out of the water. Between the two heads there is nothing but dark-blue water, white sails, and seabirds. In the other direction we look over the beautiful little Gerrans Bay, but two and a half miles across, with its white beaches, yellow and purple cliffs, black caves, ragged Pednvadden Point, and its higher fields of young corn and "tatties;" whilst peeping out from behind the point gleam the white-washed houses of our own picturesque Portscatho.

Before leaving this extreme point of the Nare Head, we make our way down to the margin of the water, and then up over the sloping turf with

its bright-blue starry blossoms of vernal squill, and so back to P'rada Cove. A drink at the crystal spring above the fall and a rest on the turf refresh us; then, looking out towards Portscatho, we discern a boat whose white sails we know. We hail the occupant, who forthwith makes for the cove, and takes us off. We sail now for the Gull Rock, and, passing between its western end and the almost contiguous Lion Rock that looks like a couchant monster, make for its outer side, where sanderlings prettily perch upon the rocks. Landing here, we scramble up the steep slope to the summit, our approach being regarded by the gulls as the signal for abandoning their precious eggs and for every one to poise on outstretched wing in an ever-moving cloud high overhead. Wherever there is a flat ledge, there we find a squabby nest roughly made of coarse grass, and containing two or three eggs. These were of two species—the greenish eggs of the lesser black-backed gull already mentioned, and the clay-coloured, sepia-splashed, and spotted eggs of the herring gull. Not a bird remained to protect her precious ova, but contented herself with uttering imprecations from a safe height above us.

The only vegetation of the rock, besides lichens,

The Home of the Gulls.

are the tree-mallow, scentless mayweed, scurvy-grass, the sea-pink or thrift, a dock, and a coarse grass. Wherever there is earth among the larger crevices of the rocks there you will find rat-holes. Rats abound, though we saw few on this occasion. They are supposed to have swum hither from some sinking vessel in the vicinity; and it is obvious that they must levy a heavy tax upon the eggs and young of the gulls, and upon the fish-food the birds bring here to consume. Otherwise the rats would soon become few, though they could exist upon the small crabs and limpets they catch at low-water. The shells of their prey are plentiful around their holes. The whole place gives forth a rather strong odour of fish-guano.

From the extreme summit of the rock we obtain fine views of Veryan Bay and the adjacent sea. It is a breezy height, and we could contentedly linger here, but our companion in the boat—whom we can see just hauling a fine pollack on his fishing-line—signals to us that the day is going, the wind increasing, and that it is time we were setting sail. So we scramble down the steep slopes as slowly as we can and jump aboard, pass safely between the Gull and the Lion, and catch the favouring breeze that

bears us straight home without beating or tacking, but not without many a wave breaking with such force upon our bows that we are fairly drenched with salt water.

IX.

THE LONG-ARMED CRAB.

LATE one evening, at the end of March, I strolled along to a sandy beach in the centre of our bay. It was dark when I arrived there, but not too dark to see a moving black knot of men, under whose feet several active little dogs were getting. I found that a ground-sean had been shot, and I had arrived at the right moment to see the men haul it ashore and pick out the mackerel and flat-fishes it contained. I saw the fish all cleared out and shared, the sean carefully heaped on the sand-dune far above high-water mark, and the fishermen—more correctly "beach-combers"—depart for their homes. Then came my turn, and I regretted I had no lantern with me; a few matches were all I had in the illuminating line. Seeking the "cod" or bag of the net, and striking a match, I beheld

several Shore Crabs and Velvet Fiddler Crabs, all very active and noisy; but I wanted neither just then, for the dim light fell upon a peculiar crab with a pair of very long arms. This and several other specimens were secured; but having exhausted my slender store of light, it was easier to get a painful nip from the savage Fiddlers than anything else, and knowing that several other seans had been hauled farther along the beach, I proposed to return next morning and overhaul them. What I then found I need not stop now to recount, but I got several good things which may afford material for a succeeding chapter. A few words concerning the Long-armed or Masked Crab, I am hoping, may not be without interest for my readers.

Those who have restricted their study of the Crustacea to gastronomic researches into the anatomy of the lobster, crab, and shrimp can have but little idea of the great variety and the singular forms and habits even of British species of non-marketable crabs. Those who are ignorant of such matters readily agree that the subject is devoid of interest, but I hope to demonstrate that this is a false view. Look now at the photo of the Long-armed Crab and say, does not its mere appearance interest you? How different in form

from every other crab of your acquaintance! How different most of the details of structure, although there is no difficulty in tracing the fundamental plan in each. That plan is the same throughout the vast legions of crab-kind, the structural details being merely

Long-armed Crab—male (*Corystes cassivelaunus*).

modified to fit differing modes of life. The Long-armed Crab has its greatest diameter from front to back, the crust is of a solid rounded character, and the limbs—except the pincer-claws—rather short. The terminal joint of these smaller limbs is very

slender, and ends in a fine, hard point. This crab spends much of its time buried in the sand below deep water, and these pointed claws enable it to dig in and bury itself very rapidly. Look well at all these limbs, and you will see that the edges which will first come in contact with the sand in the crab's downward journey are thinner than the opposite edges. The trunk, too, is of a form that readily admits of easy progress backwards through the sand; and the long, strong fore-limbs are, I believe, levers for the purpose of pushing the body down, and so getting it quickly out of the way of cod and other fishes with a weakness for crustacean diet. The eyes are comparatively small, mounted on short stalks which are so hinged at the base that they may be depressed into appropriate pockets for protection. In front of these is a pair of long antennæ, popularly, but very inaccurately, regarded as "horns;" and their basal joints are placed at right angles, so that these organs as a whole resemble bayonets. Now, with the exception of the Hermit Crabs and the Squat Lobsters, it is quite unusual for crabs to have long antennæ, though lobsters and shrimps have them. But there is a reason for everything, and the explanation of their existence in this species is that when buried beneath the sand it must

have some means of knowing what is going on in the waters above, and the antennæ are sense organs through which sounds and vibrations travel. But in this species they are, like the poet's bedstead, "contrived a double debt to pay." They are carried stiffly and straightly forward, and are covered on the inner face with a double row of stiff hairs, the points of these hairs of the two antennæ interlocking slightly, so that a kind of tube is formed through which a stream of water flows responsive to the action of the crab's gills. This stream, as well as bearing oxygen to the gills, brings minute forms of life as food to the crab's mouth; and there is a special structure of the upper crust (*carapace*) to ensure the current passing over the complex mouth-parts to the gill-chamber, and thence out under the hinder margin of the shell, where a couple of hair-fringed spaces are left for the purpose. There is no doubt that the stiff hairs of the antennæ become partially clogged with dirt from time to time; but owing to the bayonet shape of the basal joints and their mobility, the crab can brush one antenna against the other and so clean both. I have often observed my specimens doing this.

Another peculiarity of this crab will be found

in the differing shape and size of the pincer-claws in the two sexes. In the adult male they are twice the length of the body; those of the female are not so long as the body, the hand being flatter and thinner, and the general appearance of the limb feeble. The difference is probably accounted for by the female living more exclusively buried than is the case with the male, and therefore not often needing to bury herself rapidly. Also explained by the mode of life is the similarity of the "pleon" or "tail" in the sexes. In most crabs that of the male is narrow and flat or concave outwardly, whilst in the female it will be broad and convex, so that beneath it there is left an accommodating hollow in which she may carry her numerous eggs until they are sufficiently developed to be dispersed. Now in the Long-armed Crab the pleon is very small and of pretty equal size in the two sexes; the only material difference being that whereas in the female the seven jointed plates are very distinct, in the male the third, fourth, and fifth plates are consolidated. When the time comes for the dispersal of her eggs, the buried female brings them within the influence of her gills, reverses the pumping action, and sends *out* a strong current of water through the antennal

tube, by which means the ova are sent flying into the open sea above.

The most prominent feature—or rather features—of all I have left till the last: the features of a freckled human face on this crab's back, produced by the elongation and depression of the boundary lines which on most crabs mark out the different anatomical regions beneath the crust. This counterfeit presentment has earned for this crab the alternative name of Masked Crab; among naturalists it is known as *Corystes cassivelaunus*.

X.

HAULING A SPILLER.

A SHADOW fell across my desk, and I looked towards the window to ascertain the cause. There was the smiling tanned face of Joe, with his capable hands spread around it that he might the better peer through the glass and see if I was at my post. "Hullo!" I shouted.

"Going to haul the spiller. Will 'e come?"

"Certainly. Where and when?"

"Up past the point: start in half an hour."

"Right! I'll be with you."

At the appointed time I was on the rocks in the porth, watching a young fisherman skinning and cutting up a couple of anglers, to convert them into crab-pot bait, for he had still a few pots out, though most of the crabbers had brought theirs in for the season. Then Joe and his partner Will appeared and

got aboard, so I had to follow. Will looked at my box of glass jars in a way that signified they were quite unnecessary.

"No curios this trip," he remarked.

"Never mind," I rejoined; "my expectations are not great, but something may turn up, and it is as well to be prepared. You are to have the 'flats,' and I am to get the rubbish for my share."

There is always something of interest to be obtained by the naturalist on such an enterprise, though at first sight the mere hauling of a large number of baited hooks does not appear very promising—not like the haul of a net or trawl, for example. Perhaps it would be well, whilst my friends are rowing to the scene of action, to explain what a spiller is, for the benefit of inland readers. There is really little to explain, except that it consists of a very long line, similar to what one would use in plummeting for mackerel, and that from this at regular intervals depend short lines about a foot in length, each with a small hook at the free end. It is, in fact, a miniature copy of the "boulter" already described, as used in catching conger. The number of the short lines and hooks varies according to the views of the owner, or the length of line and number of hooks he has

at disposal; or again it may depend upon the quantity of suitable bait he may consider he is able to obtain for the purpose. The spiller used on this occasion included six hundred hooks, every one baited with a piece of the white flesh of the squid. More frequently lugworm is used, and these have to be dug out of the sands at low-water. To obtain six hundred lug is a large order, but one large squid will cut up into from threescore to a hundred of baits. The mere putting on the baits for so many hooks is no joke, to say nothing of first catching your squids. As each hook receives its portion, the adjoining length of line is carefully coiled in a box, so that when taken out again there may be no fear of entanglement of the short lengths. When all the hooks have been baited, each end of the main line is made fast to a stone as big as a man's head, and to this is attached another line equal to the depth of water in which it is proposed to "shoot" the spiller, and the other end is fastened to a buoy of corks to enable the fishermen easily to pick up the spiller from the bottom again.

The position of the spiller after it has been shot overboard on a stretch of sandy ground in deep water may be gathered from this diagram—

The Spiller set.

With the shooting of the spiller I have not been concerned; it was shot this morning, and this afternoon we are on our way to haul. May it come up with a plaice on every hook! Whether expressed or not, a similar hope is often in the fisherman's heart; if so, he is bound to experience disappointment, for there are many things besides plaice that have a weakness for the baits used, and contrary currents may take the scent in the wrong direction. Thus it happens that to-day a fisherman may find a very high percentage of his hooks well fixed in the interior of good marketable fishes, whilst to-morrow, with equally promising appearances above water, he finds

the majority of his baits ignored and untouched, and even on those that have attracted victims too many are worthless starfishes and anemones.

It is quite in accordance with custom and tradition, when describing any form of fishing, that the writer should give a glowing account of big specimens taken in abundance. But there are lean days as well as fat ones, when the net result—perhaps I should say "hook result"—is not sufficient to repay the fisherman for the time spent in catching his bait; and this day was a lean one. The fish were neither large nor plentiful.

As we came alongside, Joe picked up the buoy at the near end of the line, and hauled the stone sinker aboard; then gently and cautiously drew in the line with hook after hook just as it had been let down—bait intact. Then three or four hooks in succession exhibited a plaice, curling and flapping its puckered frills, until the hook was extracted, and the fish thrown into the boat, where it went through a leaping exhibition for a few minutes prior to settling down quietly. One of the "flats" was a dab, but the others all proved to be plaice, variable in size and colour, some with very bright orange spots, others with these so indistinct as to need closely

looking for. Several of them, it was curious to note, had been caught by accident, the hook being attached not inside the mouth, but in some exterior portion of the head. These individuals had evidently been examining the bait closely, and had accidentally got hooked in backing out of temptation. One big fellow hooked in this manner was hauled up to the surface of the water, and I had just time to note that the hook was outside when he gave a tremendous flap, and was free. I could see him gliding down to the sandy bottom as though he were on an invisible inclined plane, our waters being so clear that he could be kept in view for a minute or two.

By way of variety the hooks now began to bear a few specimens that were my perquisites, by agreement. At first these were But-thorns—flat, smooth stars of a pleasing pinkish-brown tint, fading away to violet at the tips of the rays. These creatures—whose correct designation is *Astropecten irregularis*—had each sucked in a piece of squid half as large as itself, and, of course, had taken in the hook with it. There were more than a dozen of these worthless stars; but as it is a species one cannot get along the shore, even at the ebb of spring-tides, I was secretly glad a few of them had come up on other-

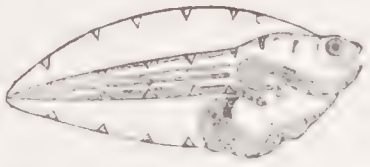
wise unoccupied hooks, though I sincerely hoped none of these had deterred a single "flat" from getting hooked. There were also, of course, several specimens of the Common Starfish (*Uraster rubens*), all with their centres bulging by reason of the squid they had nefariously absorbed. Of the other creatures that fell properly within the class regarded as my perquisites were a number of hermit crabs of two species—the Common Hermit and Prideaux's Hermit —each with its attendant anemone, which I have already described in the chapter on "Hermits and their Friends" (p. 94). A specimen or two of deep-water mollusks that had crawled upon the bait to feed completed my list. There was, it is true, a fish I might have claimed—a female Dragonet—but Joe did not like the look of the spines with which its gill-covers are protected, and took such means to extract the hook without getting "stung" that the specimen was spoiled; so I did not claim it. There was sufficient, however, to justify me in having taken a few glass jars.

To my friends the fishermen there fell twenty-seven plaice, one dab, two small rays, and four gurnards; but by a friendly arrangement at the end of the cruise these gurnards, as well as several of

the plaice, became my property. Strange to say, out of the four gurnards there were no less than three distinct species—that is, the Gray Gurnard, the Sapphirine Gurnard, and the Streaked Gurnard. I had a desire to photograph these all fresh from their native element, and was fairly successful in the effort, though I found them by no means easy to pose for the purpose.

The Plaice (*Pleuronectes platessa*) is perhaps the best known, as it is one of the most plentiful, of our flat-fishes, or "flats" as the fishermen more familiarly term them. I suppose their romantic early history—shared in all essentials by the other true flats—is now pretty widely diffused. I remember the days when considerable controversy prevailed as to the actual manner in which flat-fishes contrived to get both their eyes to one side of the head. It is now about thirty years since Malm, the Swedish naturalist, when attempting to rear the young of turbot and plaice, found that in their earliest stage, after quitting the egg, the young swam uprightly like a herring or salmon, with which it further agreed in having an eye on each side. Then they appeared to become slothful, and took to resting on one side at the bottom. This habit rendered one eye temporarily useless, be-

cause it was underneath; but to Malm's great astonishment he found that this lower eye began to travel to the edge of the head, then over the edge and along the upper surface, until finally it got ranged beside



Young flat-fish with an eye on each side.

the other eye, just as we all know the eyes of the adult plaice are situated. Now it happened somewhere about the same time that the captain of a vessel brought to the Danish naturalist Steenstrup some minute flat-fishes he had caught at sea in the

Second eye coming round.

Atlantic. Steenstrup watched these carefully, as Malm had done with his specimens; but the Dane found that the lower eye travelled *through* the head and not round the edge. Here, then, were the

materials for a pretty little controversy, which assuredly sprang up and raged for some time, for each of these careful observers believed the other to be quite wrong. Further investigations by others, however, showed that Swede and Dane were both right—that in certain species the eye always goes round the edge, whilst in other species it as invariably follows a more direct route.

Too often it is taken for granted that Plaice, Soles, and Turbot agree in their flatness with such fishes as the Skates; but the cases are very different. The flatness of the Skate may be explained by imagining that some so-called "round fish," like the herring, for instance, had rested on its belly and had a great weight pressed upon its back, which had spread out its sides. To similarly account for the flatness of the Plaice and Turbot, we should have to suppose that the round fish had lain over on its side before the pressure was applied.

Placed side by side, as Plaice and Skate were in the boat this afternoon, the difference was striking enough. You could see that the fins which fringe the body of the Plaice are the ordinary back and belly fins, whereas those which give the extraordinary width to the Skate are the breast fins. The

back fins must be sought near the base of the Skate's long tail.

The Plaice and the Dab lie upon their left sides, and in this respect differ from Turbot and Brill, which lie upon their right sides and wear their eyes upon the left side. In all these fishes the side upon which they lie is white, whilst that which is exposed to view closely resembles the surface upon which they rest. The upper surface of the Plaice is of a more or less olive-gray colour, with spots of bright or dull orange. As they lie on the sand their sharp, protuberant eyes are ever on the watch, and when a Razor-shell (*Solen*) pushes up his fleshy white "foot" above the surface, the Plaice, with a slight ripple of his fins, is quickly there and bites it off. Cockles, Quins, and other bivalves go the same way, the Plaice having a special set of strong teeth in its throat to enable it to crush the hard shells; but it has also a weakness for various species of marine worms—a weakness of which the fisherman avails himself when he baits his hooks with lug.

Plaice are generally found at depths ranging from ten to forty fathoms, and appear never to go below fifty fathoms. Their eggs, which are large—about one line in diameter—and buoyant, are shed in deep

water, but float singly in the upper strata. They hatch in from ten days to four weeks, according to temperature. The larval fish is at first without a mouth, but furnished with a yolk-sac—a provision bag containing sufficient food to nourish it for a week, by which time the mouth is developed and fit to accommodate the minute crustaceans which constitute its food for the present. On the British coasts Plaice reach a length of a couple of feet or more, but from Iceland they have been obtained over thirty inches in length. The largest British example recorded is one measured by Dr. Fulton on the east coast of Scotland—28 inches long; and Mr. Cunningham says the largest measured at Plymouth was 24 inches, but that this was exceptionally large; ordinarily very large ones on the south coast do not exceed twenty inches. I have a note of the largest brought to me (Portscatho, Cornwall): "Oct. 23, 1896, length $25\frac{1}{4}$ inches, breadth 14 inches." I omitted to record the weight, but believe it was over twelve pounds. It was caught in deep water on a conger-line. Specimens over a foot long are never taken close to the shore, for when they reach that length they are sexually mature, and seek the spawning-grounds far out.

There is much one might say of Plaice without exhausting the interest, but we must devote a little of our space to a brief description of the Gurnards, of which half a dozen species occur on our shores, though they cannot all be considered important as food fishes. The differences that separate the species are sufficiently marked, yet there is a strong family likeness connecting them. They are thick-set fishes whose heads are the most bulky part of them, and from which they gradually taper to the tail, but maintain a solid and substantial appearance all the way. They have none of the transparent silvery sheen so common among fishes, the colouring being of a more opaque character, except upon the fins. The head has got an armour-clad appearance, due to the fact that the spiny bones are not invested with soft skin. A further feature common to them all is found in the three remarkable curved finger-like organs at the base of the breast-fin on each side. These fingers are really three of the rays of the extensive breast-fins which have become separated from the delicate fin membrane at an early stage of development. When the young Gurnard leaves the egg, it is endowed with breast-fins of enormous size when compared with the proportions of the fish, but there are

no separate fingers. These break away from the fins at a later stage, and become comparatively thick and rounded—a fact that seems to point to the ancestral Gurnard, the founder of the line from which these six present-day species at least can trace their common ascent, being more given to leaping above the surface of the water, and so depending upon great fin-development, than to turning over stones at the bottom. That is the purpose—or the chief purpose—to which the Gurnards apply them in their search for the worms and small crabs that love to lurk beneath such cover. It is also probable—though this has not been satisfactorily proven—that they use them as organs of slow locomotion. The principal food of the Gurnards is of a crustacean kind, chiefly swimming crabs and shrimps, but they also consume considerable numbers of launce and sprats, and young flats of various kinds.

It is greatly to be regretted that the writers of works on natural history have not more industriously gathered up and used the folk-names of animate things. It is most exasperating when you are mixing with fishermen, for instance — and the same applies to ploughmen and foresters—to find that the English names given in the books are, to a large

extent, unknown. Sapphirine Gurnard, for example, is a name that never originated with the people, nor is it known to those who catch the fish for the market; with them it is the Tub. The Gray Gurnard is known to them as *the* Gurnard, Hardhead, or Crooner, and the Streaked Gurnard is the Rabbit-fish.

The most widely distributed of the British species is the Gray Gurnard (*Trigla gurnardus*), which is known in Scotland as Gowdie. Its name of Crooner is obviously suggested by the crooning or grunting sound emitted by it, probably as a means of communication with its friends. The Piper (*Trigla lyra*), a species frequently taken in these Cornish waters, is the largest of the group, and the Gray Gurnard comes next to it in point of size. The latter is the most soberly tinted, but we do not admit that it is therefore the least beautiful of them. The general effect produced by its mottled back is of a gray colour, prettily speckled with white; but the gray, examined closely, is generally found to be a yellowish olive. The "lateral line," which runs from a short distance behind the eyes, and exactly below the beginning of the first back-fin, is clothed with spinous scales. The breast-fins do not reach so high a condition of development as in some other species.

The Tub, Sapphirine Gurnard, or Latchet (*Trigla hirundo*), as it is variously designated, is one in which the breast-fins are very long, very broad, and beautifully coloured. The prevailing colour of the fish is red, with a frequent tendency to brownishness on the back, and paling away through yellow sides to white beneath. The colouring of the breast-fins includes a line of blue round the delicately scalloped edges, then a clouding of red, and a centre of blue; but on the reverse side this blue is exceedingly beautiful and diaphanous. As though conscious and proud of this lovely decoration, the Tub is fond of turning this side upwards when at rest, though, according to the rules, it ought to be closely pressed to the fish's side.

The Red Gurnard (*Trigla cuculus*), though it is only one of five red gurnards, is also known as Elleck, Soldier, Red-fish, and Rotchet. It may be confounded with the Tub by superficial observers, but may be distinguished at once by its more rapidly tapering body, thinner back, more brilliant red with ruddy golden patches, by all the fin-rays extending as spines beyond the thin membrane (in the first back-fin especially), and by the smaller size of the yellowish-red breast-fins.

In general form the Streaked Gurnard (*Trigla lineata*) resembles the last-named, but here again there are striking differences for those who really observe. The scales on the lateral line are spiny, and from the back-fins on each side little ridges run down the sides, which give a distinctive character to it at first sight. The long but rather narrow breast-fins are red, edged with blue, and spotted and banded with blue and green. The sides and back are marked with a kind of network of darker red above the vermilion ground tint. My neighbours sometimes call it the Emigrant, a name of doubtful fitness, seeing that they take it pretty constantly; but another of their names, the Rabbit, is rather a happy one, for the profile of the head, with its big eyes, is not unlike that of a bunny. I admit that it is a trifle misleading for the inland visitor who hears a fisherman enumerating his catch, and confessing to three rabbits and half a score of dogs.

The remaining creature that demands notice is the pinky-brown But-thorn (*Astropecten irregularis*), a sea-star which has five straight-sided, lance-shaped arms, bordered with more or less rosy cushions, and fringed with long, flattened ivory-like spines. Looked at from the side, it will be seen that these cushions

are the summits of closely-set transverse plates which bear, besides the fringing spines, a large number of other spines of various sizes and shapes, on the lower surface. It appears to feed chiefly upon small mollusks, most of those I have taken having a number of pretty little Necklace-shells (*Natica glaucina*) in-

But-thorn (Astropecten irregularis).

side them, in addition to the pieces of squid with which their centres and the broadest part of their arms were distended. On the majority of the specimens obtained I found, in the avenue under one of the arms, specimens of a bright-red worm called *Acholoe astericola*. It was impossible to get a complete specimen of these; they were as "touchy" as

brittle-stars, and snapped in two or more pieces with the utmost readiness. One imperfect individual I examined consisted in his abbreviated condition of over a hundred joints, each bearing on either side a bunch of gleaming crystal lancets. The back was covered by a double series of nearly round overlapping scales of large size. It is a highly phosphorescent creature, its green light being visible in the day-time. One of these worms, detached from its host, had got in the way of a Hermit, and so to the Hermit's mouth. I had not witnessed its disappearance, but my attention was drawn by the unwonted spectacle of green fire issuing from the crab's jaws, and the worm was ejected with evident disgust, shining like a glow-worm from every joint. Whether the worm in generating the light also gave out an unpleasant excretion, I cannot say, but the crab seemed to be in a great hurry to get rid of an unpalatable morsel. What the terms are upon which the But-thorn gives house-room to the *Acholoe* do not appear to be known, but the latter is no doubt a scavenger.

XI.

CHARLIE—THE STORY OF A TAME SHAG.

IT was on May Day that Charlie and I first met, the place of meeting being the steep summit of a high island rock off the Cornish coast. Three of us had sailed out in order to see the nests of gulls, guillemots, razorbills, and shags with which its slopes and ledges abounded. Our boat lay at anchor tossing on the dark-blue waters far below us, and the crew, after climbing well-nigh every peak and slope, was taking lunch on the topmost ridge. Then F. disappeared over the edge, and worked down to a terrace on the landward side. As the remaining two—V. and I—sat there more leisurely finishing their repast and watching the evolutions of the sea-birds all around their rock, a voice came faintly up from the side where F. had vanished. V. hung half over the edge and shouted to him, "What's the trouble?" and

then informed me the reply was, "Caught a shag!" Thinking he was referring to an adult bird, and that "caught a shag" was of similar import to "caught a Tartar," I told him to bring it up, just as I should have done had he reported the capture of a mermaid, and I expected to hear in reply the time-honoured "But he won't come," or "He won't let me." But after a brief interval F. appeared up a chimney-like gully with a mass of sooty down in his arms, from which a head and long neck soon extricated themselves. It was a very young shag—too young to exhibit any fear of its captor.

"Whatever are you going to do with that?" I demanded.

"Don't know; you told me to bring it up," was the reply.

"But I did not know it was so young a bird. Take it back to its nest."

"Not I. You told me to bring it up, and here it is at your service. Besides, it would be impossible to put it back in the nest, unless I did it from a balloon."

"But what is to be done with it?" I asked.

"Put it in your bag and take it home—tame it!"

"Are you aware," I inquired, "that there is a Sea

Birds Protection Act, in which, if my memory is not at fault, the shag is scheduled? This is close-time, and a penalty attaches to all who now take the birds."

"That's all right," replied my tempter; "but I believe that you are exempted from the pains and penalties when you break the law in the interests of science. Do you not want to study the habits of young shags, and obtain particulars of the rate of growth, the change from fur to feather, and so forth?"

"But, my dear fellow, he will want food; and, so far as I have observed the habits of the species, I am inclined to believe he will require a prodigious quantity of living or very fresh fish. How is it to be done?"

"Oh, I will see that he has enough to eat. I'll put out a trammel specially to catch fish for him."

It seemed useless to continue the discussion. My deprecatory arguments had not sufficient force, and I somewhat weakly put the uncomplaining shaglet into my empty lunch-bag. Embarked upon the boat again, I opened the bag to give him air, and kept it open, but he made no effort to get out. I thought this a bad sign—that he was already suffering from

the absence of parental care. Yet he looked up at me in an apparently intelligent manner, and uttered a low whistling note, which sounded much like, "Be *care*ful, be *care*ful." I promised him I would regard his admonition, and our relations henceforth were of the friendliest character.

Arrived at home, I placed him, *pro tem.*, in a lidless box; but to prevent his escape I laid a piece of wood across the top in such manner as would allow him light, air, and an opening for protruding his long neck. I inquired for food, but just then it happened that no fish could be obtained. By means of a little special pleading I persuaded the lady of the house to disfigure the Sunday sirloin by cutting off a few strips of beef. The shag looked at them as I held them near, but beyond telling me to "Be careful" he took no notice. This was probably due to the fact that butcher's meat was a novelty to him, but I then regarded it as due to the fact that he was unable to feed himself. So I opened his beak and dropped the beef into his capacious throat without any difficulty. A few hours later I obtained some freshly-caught pollack for him, and was able to pretty well fill him up with pieces of the same, taking quite unnecessary pains to cut them small.

He rebelled against the too strict confinement of his prison, and forced his way out, flopping about the cement floor of the "back kitchen" in a quite ludicrous manner. But there are certain points in the economy of the cormorants which made it improbable that he could maintain both his liberty and the favourable opinion of the head of the house. Anxious that he should continue in the good graces of this all-powerful lady, I took care to declare my intention of raising a house of stone for him in the garden as soon as the Sabbath should be passed, and meanwhile fenced off a liberal space in the back kitchen, where I hoped he could remain until the house was erected. Candour compels me to admit that the house was not built on Monday owing to some unforeseen circumstance, and on Tuesday I was reminded that Wednesday was washing-day, when no one would be answerable for the fate of the shag were he still left in the back kitchen.

So on Tuesday I bestirred myself, and erected three unmortared stone walls against the high boundary hedge at the top of the garden, enclosing sufficient space for six shags, laying large rough masses of rock on its floor for roosting purposes, and roofing in with some old sash-frames from which nearly all the glass

had been broken. Here he had room to flap his plumeless wings and waddle around. At feeding-times—thrice a day when fish was plentiful—he was allowed to come outside and walk about the grassy terrace, whence he could see his native Gull Rock and the inviting cliffs of the crescent bay. He would stretch out his long neck in all directions, as though scanning the blue waters and the purple rocks for a sight of his own kindred. I very soon found that he had become personally attached to me, for on leaving him at one end of this terrace and going to the other extremity, he would come sailing along after me in an ungainly way, with his wings spread widely. He would step upon my feet and rub against my legs whilst he looked up to my face and repeated his "Be careful" song. I wondered whether he would follow any distance, so left him in front of his house and walked down the steep garden slope. When half-way down I called, "Charlie, Charlie!" and he ceased his marine surveying, put on all his available force, and sailed down very rapidly. I continued my course and passed by the family dwelling to the cliff road, Charlie trotting like a very active goose behind me. I then turned round, having a suspicion that his following was due to the fact that I was walking

seawards and away from his prison; but he was equally ready to return, and walked behind or beside me all the way back to his house. Thereafter I had no difficulty in getting him to follow me or to run to me when I called his name.

We fed him upon such fish as was procurable, but chiefly pollack, mackerel, pilchards, and wrasse. He was very fond of the viscera of fish cleaned for the table, and would gorge upon the liver and roe of a skate to such an extent that he would be unable to touch any more food for a day and a half. A pollack of about eight inches we would cut into four pieces, making the cuts diagonally, and leaving the bones, fins, etc., *in situ*, these offering no impediment to digestion, which in the shag is of the most thorough description. F. used to shoot his trammel for the express purpose of getting a constant supply of fish for Charlie; but sometimes this source failed, and he would have to wait longer intervals between meals. Not that this was any particular hardship to him, for animals that are in the habit of gorging when opportunity offers are usually able to bear temporary lack of food with equanimity.

One day Charlie explained in a very striking manner that we were wasting time in the prepara-

tion of his meals. F. and I were scaling wrasse and cutting up pollack, when Charlie sprang up on the cutting-board and seized a whole pollack by the middle. Throwing up his own head, he jerked the fish round so that it entered his bill head first, and in less time than it takes to record the fact the pollack had disappeared from sight, though its shape could be seen distorting the neck as it passed down. That was an object lesson intended to convince us he no longer needed his meals cut up for him, and thereafter we gave him ordinary-sized fishes whole.

Charlie was fond of company, and if he heard my voice in the garden would immediately put his head between the bars of his house and set up his song. Sometimes it happened that, owing to the exigencies of work or social engagements, he had to be left unnoticed for a longer period than usual, when he would express his resentment by contriving to escape from his house somehow. He was most clever at discovering weak places in the masonry, and sometimes I had difficulty in detecting where he broke through. That part of the garden where stood his house was at an elevation more than twice the height of our dwelling-house, and the steep slope was ascended by a zigzag path. This path also

served for the Independent Sunday school, which stood half-way up.

One Sunday Charlie was on short commons. The previous day had been so rough that the boats could not go out, and there was only sufficient in Charlie's larder to supply him with breakfast; I had therefore kept away from him at dinner-time for fear

"Charlie."

that my footsteps would raise false hopes and cause disappointment. In the afternoon the children began to gather for Sunday school, and whilst they were waiting for the teachers Charlie broke out of his house, sailed down the upper path, and leaped on a low wall beside them, from which, with outstretched neck, he gravely admonished them to "Be careful!" The children huddled together away from him and

screamed. Others, newly coming up, rushed back, and several came to our door to inform me of the danger of their companions above. I went up and remonstrated with the bird, and persuaded him to return to his house with me, but failed to see how he had got out. Charlie remembered, however, for before I had reached the bottom again he was in full pursuit. This time I detected an opening near the top, from which he had pushed out a piece of stone, and to which he had climbed by using his hooked beak as a lever.

By this time Charlie had got his wings fully plumed, his back was covered with feathers, and the tail was well formed. Then I was advised on all hands to clip his wing-feathers or to pinion him, and so prevent his departure to the cliff-ledges. To this I replied that I had strong objections to the maiming of any animal, and that if he chose to seek the companionship of his kind he was entirely free to do so.

On the afternoon of Diamond Jubilee Day the village was deserted by all but the old and feeble, the others having ascended the hill to the sports field and the high tea. Charlie was left alone, and not liking the quiet, broke out, and came down to find

out what was wrong. But this part of his story had better be told in the words of the old lady who had most of his company that afternoon.

"Iss, sir; I'll tell-ee just how 'twere. I was a-setting down a-taking of it easy-like, 'cause being Jubilee I didn't reckon to do no work. I couldn't get up to the tea and sports, so I thought I'd keep Jubilee at home to myself. Well, my dear, I was a-setting down, quiet-like—I might a'been dozing for all I know—when all on a suddent I heard a pretty old confloption outside, so I got up as quick as I could and went forth; and what should I see but old Mr. Hunkin a-trying to heave your bird over the wall into your garden. He managed to get him over, and then he went away. 'Oh, you old silly!' I thought; 'what's a-good a-doin' that? Afore you know it he'll be out again. Why didn't ye put him in a barrel or something?' Sure 'nough, my dear, as soon as he was in he was out again, and if he wasn't a-comin' straight down to my door as fast as his wings and great feet could bring him! And the worst of it was, I hadn't got my stick, and I didn't altogether like the looks of him. He was flopping his wings and screeching a pretty lot. I was going back to get my stick when in the porch I knocked

agin an old flasket. All on a sudden I thought, perhaps I could get him in there. He was comin' t'ards it, so I helped un along wi' my foot, and tried to heave un in. I did at last, but he give me a pretty hard bite on my finger. Now I had un in, but how was I going to keep un there without a lid to the flasket? I didn't know what to do till I thought of an old cheer to put over it. But, to make sure he didn't jump out and bite me again, I thought I'd tie his legs together, so's un couldn't walk. And after a bit I managed to, though I couldn't tell-ee how I did it, for he was just a-pecking at me all the time with his long beak and flapping his wings so's I couldn't see what I was doing. Now I felt safe, and went to find something to cover right over the flasket, cheer an' all, when I see un flying out of the door; and he got right on the edge of the cliff, and I was afeared for my life the poor bird would fall over and be smashed to bits on the rocks. But a dog came along and frightened un on the path again, so I hobbled out and caught un and put un back in the flasket, and when I'd put the cheer over un I covered all with a sack. Now, thinks I, you're safe this time, my dear, sure 'nough; so I went and set down again as I was doing afore he come along. Then an awful

thought struck me: the poor bird had got his legs tied. Suppose un tried to get out, and was flapping his wings against the flasket. I must untie un. So I fumbled about and found a hole in the flasket, and got my hand through, and when I found his legs he kept pecking my fingers, he did, my dear. But I thought I must put up with it all till I'd set un free, poor thing. And then he was quieter like, and there he stayed under the flasket till you fetched un home."

The dear old soul had really acted bravely, for she regarded the shag as a savage beast, and was only impelled to do what she did from the feeling that I should feel annoyed if he flew away or came to harm. Under the circumstances her action in tying the bird's legs amounted to heroism.

After this event Charlie was allowed more freedom. In front of our house is a wall about two feet high, with broad stone cap, and within this enclosure Charlie was allowed to strut up and down on the gravel and spread his wings in the sun, as well as enjoy the closer proximity to human associates. Owing to the slope of the cliff the end of the wall nearest the sea was higher than at the other end, and Charlie knew the difference. One end was too high

for him to leap to the top, but at the other, by flapping his wings and taking a spring, he could catch his hooked beak on the top, and using this as a lever, flap his way up. One day, when he was supposed to be sitting in this walled space, I heard some person saying, "Oh, there's your old friend down there; he's got out again."

I guessed this referred to Charlie, the remark being addressed to the old lady whose Jubilee experience has been narrated above. On looking through the window I saw he was not in his proper place, so I went to the edge of the cliff and looked around. There was a matronly speckled hen with an extensive brood of chicks feeding at the top of the cliff among the weeds, but no Charlie. I called him by name, and at once an answering "Be careful" came from under my feet. In an instant the bird popped up, scattering the chickens with fear; but they had a competent protector, who now rushed with open bill and spreading wings at the poor shag, and he, fearful of the hen's intentions, leaped into the air, and at a height of about seven feet appeared suddenly to realize the fact that he could fly. Acting at once upon this knowledge, he turned his head to sea and flew straight out. "Ah!" said I, "he has really gone

this time." But he halted upon a rock encircled by water, and by climbing over the intervening rocks for some distance I was able to come within a few yards of him. "Charlie," I called, and immediately he quitted his rock and swam to mine. Pleased with this fresh instance of his attachment, I suggested he should have a swim, and gently threw him into the water with his head away from me. Evidently understanding the suggestion, he paddled out to a considerable distance and swam around in big circles, occasionally indulging in a dive. This was by no means his first swimming effort. I had on several previous occasions taken him to the shore and set him adrift in the largest and deepest of the rock pools. He now performed admirably, but he appeared to have no idea of fishing. After a time I called him in, and he followed me up over the rocks to the front of the house. This was in partial shade, and he could not find a good place for drying his wet plumage, so he came into the house and made his way into the dining-room, where he could see a broad patch of sunlight which came through the back window and fell upon the carpet. His presence was objected to, and he was driven out of doors; but he returned again and again, until at last the prohibition

was removed, and he was allowed to utilize the sunshine fully.

Occasionally I took him down to the porth, where the boats were moored and where the boys perform their swimming and diving feats. Here he, too, would swim out and dive, always with the certainty of a considerable audience; and on every occasion he duly returned to my call and perched upon my feet. But this attachment became a source of anxiety to me, who had hoped that with the attainment of full powers Charlie would be seeking his own kindred and be leaving me. It was not an easy matter to keep him supplied with plenty of fresh fish. F., who had kept his promise well so far, was soon to go to college, and then the winter would be coming on, when for days in succession the boats might be prevented from putting out on the stormy sea. With no market near it would be difficult to keep him in food, for he would now take nothing but fish, and the common shannies and father-lashers which one could easily catch in the pools he declined to look at. Carefully weighing these points, I decided to offer him to the Zoological Society to be placed in their gardens, and in due course received an intimation that the society would be pleased to accept him. I

therefore placed him in a roomy, well-ventilated box, and sent him off. As the box, duly labelled, lay outside waiting for the conveyance to take me to Falmouth with it, one of the fishermen exclaimed, "What a jolly shame to send *our* shag away!" It had become one of our village lions.

Whilst I was instructing Messrs. Pickford's representatives to take care of him, Charlie recognized my voice and broke into a series of "Be carefuls," which he presumably continued at intervals, the railway officials, no doubt, attending to his requests, for he reached the Zoo in safety, where he lived in the fish-house for about four years. Alas! the keeper re-christened him "Billy," and when I paid him visits and watched him diving after little fishes in his glass tank he no longer responded to my call, but reserved his attentions strictly to the one that fed him. But in our family circle we retain pleasant memories of him, and to us he will always be Charlie.

In the spring of 1901, having then attained the good age—for a shag—of four years, Charlie passed away, and another shag now occupies his place in the fish-house.

XII.

HUNTING THE ANEMONE.

THERE are some forms of life indigenous in these islands that appear to be fated to remain unknown to the multitude. In some cases minuteness of size is quite sufficient to account for their neglect; the general public cannot be expected to take its country holiday with a compound microscope in its hand. Other creatures continue to be unknown or misunderstood because their forms or habits give rise to feelings of disgust which prevent a closer acquaintance. But neither of these causes operates to keep people in ignorance respecting sea anemones, which are readily perceived by the naked eye—some native species being four or five inches in diameter—are of the most beautiful and mobile forms, and are painted with the most exquisite tinting. Black-and-white cannot do justice to them, yet the truthful illustrations

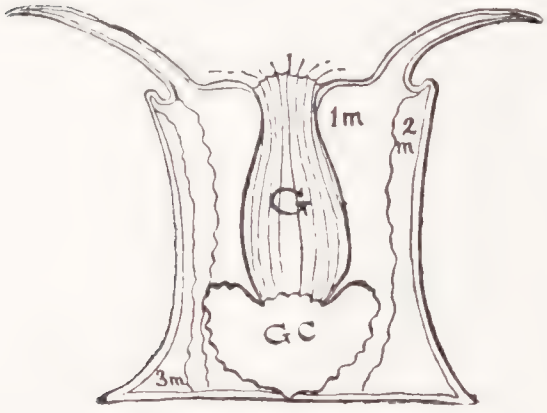
Where Anemones may be found.

in this chapter do, I think, make good my claim of beauty of form. Few persons have troubled to study or write about these, except from the severely technical point of view, and chiefly from specimens preserved in spirit, which takes away their beauty altogether. Even in our National Museum, the student who would make himself acquainted with the forms of the anemones will find no specimens of the Actinozoa exhibited; instead he will be shown some cranky figures in blown glass which are *supposed* to represent them. These ought to have been left in the lumber-room at Bloomsbury when the Natural History collections were removed; they are out of keeping with the general contents of the building, and are gross libels on Nature, as well as a blot on the reputation of the British Museum.

Yet there is no great difficulty in the way of studying most of these lowly animals in their natural habitat, provided always that we have access to a rocky coast; or they may be regarded as quiet pets and maintained in large or small marine aquaria—that is to say, anything that will hold sea-water, from a twenty-feet tank to a thin glass tumbler or even a soup plate.

Now I propose to make believe that I have in-

duced the reader to try the experiment of keeping anemones, and that he has consented to be personally conducted by the writer on a hunting expedition among the rock pools at low-water. I am so fortunately situated as to live where I am partially surrounded by rocks, in whose surface the sea has scooped out basins innumerable, which the retreating tide leaves full of water for the comfort of the creatures who have elected to spend their lives therein. Of course there are many other things, both animal and vegetable, in these pools, but we can scarcely notice any of these just now. Before we descend to the rocks it might be well if I indicated simply and in few words what is the general plan upon which anemones are built, because it differs from the ordinary forms of animal life with which we are well acquainted. Roughly speaking, an anemone is a bag of very soft leather, whose upper margin is fringed with several rows of tentacles, and from their bases a membrane stretches across to close the bag, all but a



Diagrammatic Vertical Section of an Anemone.

small though extensible slit. From this central opening, which is the mouth, an inner tube or gullet (G) hangs down into the general body cavity (G C), but does not extend to the bottom of it. The body cavity is also divided by a series of muscular plates (1 *m*), which radiate from the gullet to the outer walls, and between these other similar plates (2 *m*, 3 *m*) stand out from the circumference, but are not broad enough to join the gullet. Now that is all there is to describe. The anemone is not troubled with heart, or lungs, or brain. The general body cavity serves to digest its food, from which the nutritive portion circulates with the water of which the animal is largely composed, and so becomes absorbed by the inner surface as a whole. Of course there are muscles which enable the creature to draw in its tentacles, and there is a nervous system of a primitive type, but there are no special sense organs. So much for the interior. The cylinder is generally spoken of as the column, which is attached to rocks by its base, and the other extremity is known as the disc, bearing the tentacles and pierced by the mouth. With this small amount of structural knowledge we are in a position to understand the varied forms of the species, and to learn their different habits by seeking them among the rocks.

Yesterday was the period of "full moon;" this morning, in consequence, the tide flowed much higher than usual, and in an hour's time it will have gone down the shore to a greater distance, and left a much broader zone uncovered. This is our opportunity; let us embrace it. We will take with us an assortment of thin glass jam-jars and a glazier's putty-knife. That is all in the way of impedimenta we need. The long stretch of rocks that bounds Portcurnick sands shall be our hunting-ground, for there the rocks are much cut up by fissures of varying width, with sandy bottoms. Acting according to habit, we make first for the edge of the water, to follow it out to its lowest ebb and to slowly retreat again before it as the rising tide drives us back. The lowest rock stands much higher out of the water than the others, and the deep channel to the west of it is ordinarily impassable, because filled with a swirling rush of water. Now, however, we can get into it and carefully scrutinize the rock surfaces. Out of the water most of the anemones contract into low, rounded jelly masses, so we must not expect to see them with erect column and expanded tentacles. Now to business.

On the shoreward vertical face of the outer rock,

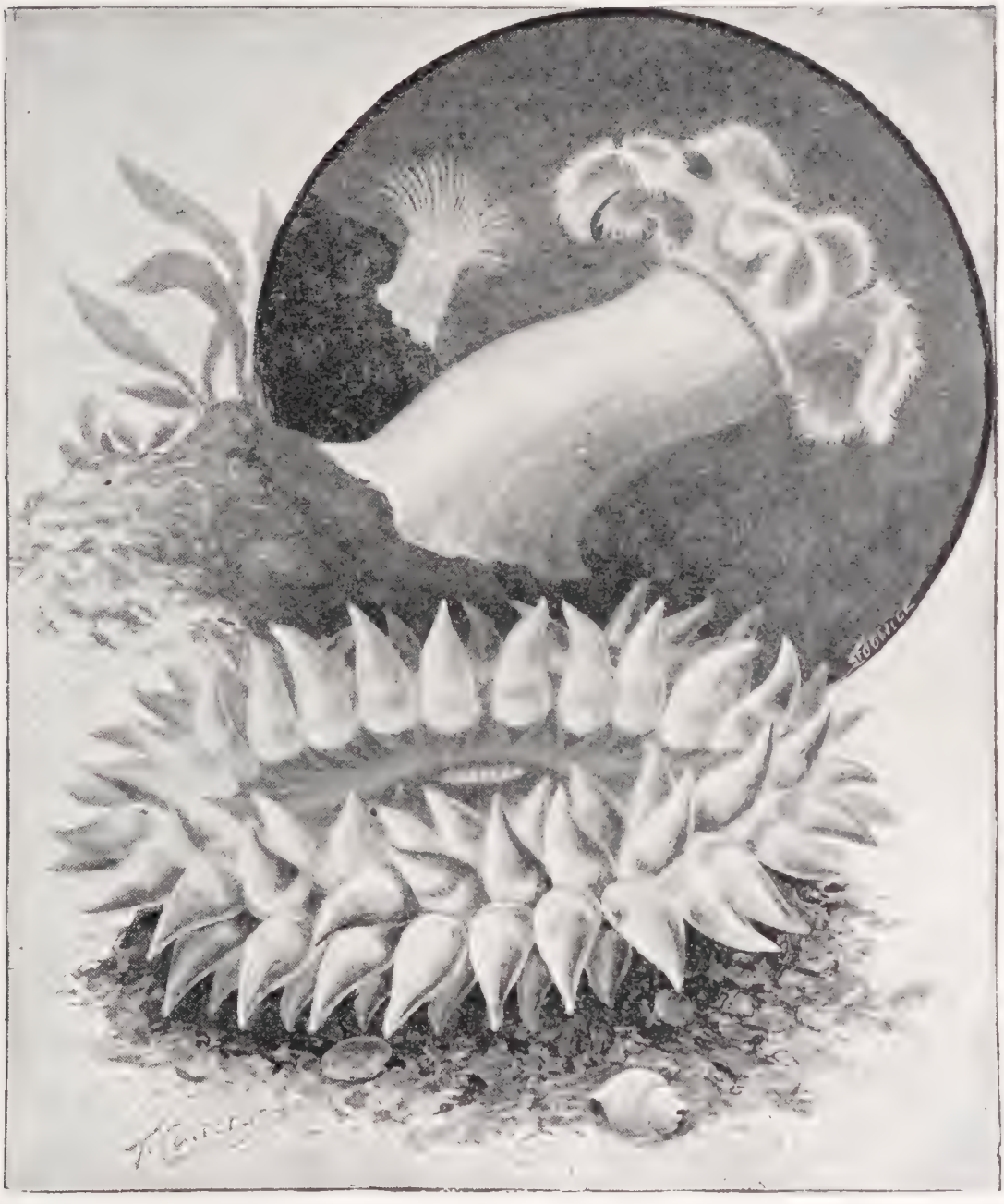
The Home of Anemones.

now well out of the water, there hang many orange-brown anemones, with the tips of their white tentacles slightly protruding. Several of these are secured and transferred to one of our bottles, where they soon open out more widely and reveal themselves as the Snowy Anemone (*Sagartia nivea*), the tentacles and disc being alike white, without any markings whatever. A few yards away on the same rock

face are several masses of almost transparent jelly, with a whitish coloration, which we know to be the resting condition of the Plumose Anemone (*Metridium senilis*), and these, after a short immersion in our bottles, increase greatly in height and reveal a projecting collar near the summit of the column, above which the disc expands into several graceful lobes, each fringed with white tentacles. These lack the opacity of the Snowy Anemone, though there is a more distinctly white band across each. When distended by water to its full proportions, as at nighttime, this species becomes sufficiently transparent for us to see into its interior. Some varieties are red, pale orange, or flesh-coloured, but those we have obtained are all of the translucent white form which is figured on page 191.

All over this and the adjacent rocks are multitudes of the Beadlet (*Actinia equina*), the most plentiful of the British species. Young specimens appear to like an air bath twice a day, for they are on the rocks at such elevations as are only covered at half-tide; but these rarely exceed an inch in diameter, whereas, lower down, where they are always immersed, they are mostly large specimens, two inches and more across. This is the most variable of the native species,

Pallid Anemone. *Plumose Anemone.*



Dahlia Anemone.

and may be buff, orange-brown, liver-colour, crimson, dark red spotted with green, entirely pale green, or

dark green. The liver-coloured specimens are the typical and commonest form. In this species the column is very smooth, much broader than high, the base still broader, edged with a narrow line of bright blue, the tentacles crimson, and just below them a series of large, blue, bead-like spherules, from which the creature derives its popular name. This typical form is represented by two figures, expanded and closed, at the left of the illustration on page 193. This and several forms are plentiful on the rocks all around us, but the very large specimens in the water at the base of the high rock are the so-called strawberry variety, with green spots on a crimson ground, and the crown of tentacles expanding to a diameter of about three inches. The now historic anemone ("Granny") of Sir John Dalyell's was a Beadlet taken from the rocks at North Berwick in the year 1828. I do not remember to have heard of the venerable Granny for some years, and cannot say if she be still living; but less than twenty years ago she was well and thriving, continuing to add to her numerous progeny, and outliving her caretakers. Professor Fleming took charge of Granny on the decease of Sir John Dalyell, and was in turn succeeded as guardian by Dr. M'Bain. The worthy doctor, when he felt that he

was slipping away from life, was very anxious about his charge, and desirous of settling the succession to this important trusteeship before his death. But at first he found difficulty and received several refusals from friends, who imagined the honour or the responsibility was too great for them. At length the onerous

position was accepted by Mr. Sadler, curator of the Royal Botanic Gardens, Edinburgh, in whose care Granny remained when last I heard of her. I have a hazy notion that her death was reported a few years ago, but I do not feel sure that she is not still living.

This Beadlet is, perhaps, one of the best to enable

us to get some notions of actinian life. The base of the creature, we find, is a kind of sucker, although it possesses no special apparatus beyond its softness, mobility, and stickiness; these are sufficient to ensure perfect contact with the rock surface, and enable it to withstand alike the heavy swell of the sea and the battering of the biggest breakers on the littoral rocks. But, having attached itself in this manner, the Beadlet is no permanent fixture; as a matter of fact, it is a species not much given to wandering, as some are, but it has the power to glide along on its base much after the manner of a slug, and so is able to attain such position on the rocks as best suits its individual taste. The spherules around the summit are popularly set down as eyes, but so far without any authority from science. These are sometimes found almost colourless, and occasionally of a red hue; from many specimens they are absent altogether. When present, they number from eighteen to forty-eight, according to the stage of maturity reached by the Beadlet. In a fully-grown individual with forty-eight of these spherules there will be found, if you have the patience and skill to count them, about 192 tentacles arranged in six cycles. The difficulty of counting is due to the frequent movement of these organs and the ease

with which you can overlook the point from which you started. These tentacles are a most important—*the* most important—part of the anemone organism: they are its hands. Put a finger-tip in the midst of these, and immediately you will find that most of them have become attached to it. Draw away your finger, and you will be aware that there was something more than mere contact. If you are a particularly sensitive, thin-skinned individual you may complain of a slight sensation of pain in the finger-tips, caused by the emission of a number of exceedingly minute stinging threads from the surface of the tentacles, which have penetrated your skin. You may be, like myself, too thick-skinned and insensible to notice anything more than the attachment. Even in that case, I will not recommend you to repeat the experiment of Dr. Waller, who told the Royal Society, years ago, how he had allowed the Beadlet's tentacles to touch the tip of his tongue, and detached them with difficulty, and with acute pain resulting, followed by distressing local symptoms and subsequent minute ulcerations. You may, however, be inclined to follow the safer example of Mr. Gosse, who cut a thin shaving from the thick skin of his own foot, and allowed a Dahlia Anemone to pierce it with its stinging

threads. Then he placed the shaving of callus under the microscope and examined it with a magnifying power of 600 diameters, finding the barbs of the stinging threads hanging out well from one side of the shaving and the threads hanging from the other side.

Such being the penetrating power of the anemone's darts where tough callus is concerned, you may form some idea of the deadly nature of the tentacular embrace when the fry of a fish, an unwary shrimp, a juvenile crab, a sea-snail, or other small creature, has the misfortune to come in their way. The barbed stinging threads arrest him, and all the tentacles bend towards him, the disc itself curves its edges over towards the mouth, and soon the captive is safely imprisoned in the anemone's gullet.

Upon that portion of the rock where we found the Plumose Anemone there are numbers of exquisite little forms a quarter of an inch across and of a transparent and vivid emerald-green colour, with globular rosy heads to the conical tentacles, which number about a hundred. This living gem, which never fails to evoke enthusiastic notes of exclamation when seen for the first time, is known by the popular name of the Globehorn, otherwise *Corynactis viridis*. This is a

species that is not widely distributed; it occurs only on our south-western shores, and there in colonies. Some forms have the column red and the tentacles green, but generally it will be noted that there is

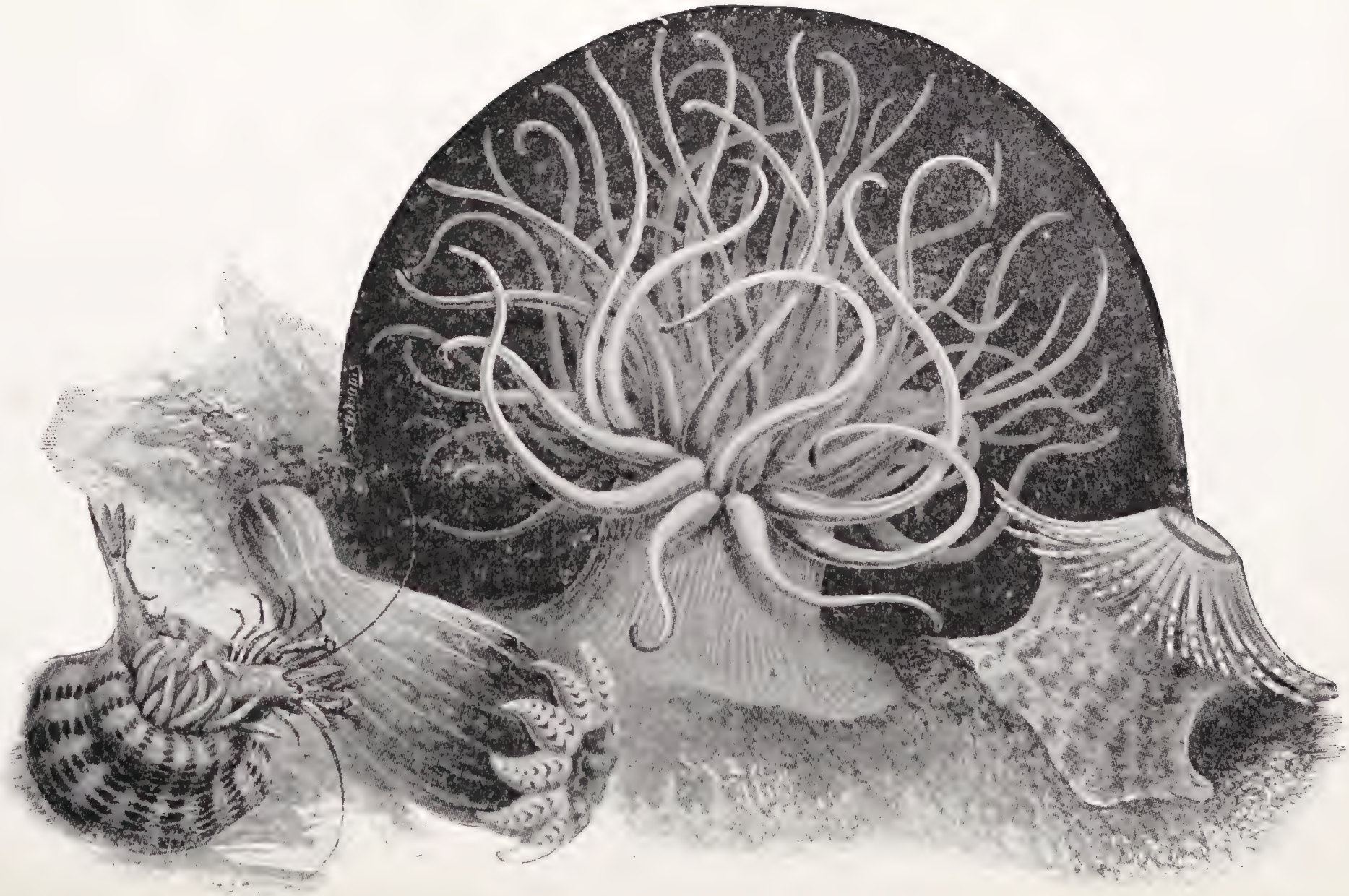
Globehorn Anemone.

little if any variation in each colony. It has a great fondness for the vertical sides of rocks, and that side which looks landward. The removal of specimens without injury is not an easy matter; but where they are growing, as in this instance, on a rock covered

with acorn-shells and tube-worms, *these* can be flaked off by a judicious use of the putty-knife, without disturbing the attachment of the Globehorns. Placed on a sloping rough piece of rock in the aquarium, they will soon forsake the *débris* of acorn-shells for the firmer rock.

Right at the base of the rock, in the angle formed by its contact with the sand, there are numbers of the large and showy Dahlia Anemone (*Urticina felina*). This great fellow, which is shown at the foot of the illustration on page 191, is much broader than its height, though it is capable on occasion of pulling itself together and assuming a spherical shape; but its ordinary open appearance is that shown in the illustration. The upper part of its broad column is studded with warts which are also suckers, and by their aid it covers itself with gravel and fragments of broken shells, so that when its tentacles are withdrawn you have an apparent heap of gravel before you. This disguise is perfect, but, nevertheless, it cannot deceive the practised anemone-hunter. Our friends marvel at our insight when we say, "There is a Dahlia, and there another," and so forth; but when one sees the gravel moving he knows there is something beneath, and the shape of the heap, the position,

the particular kind of movement, and other indications, are sufficient for the trained eye. The Dahlia is very variable in coloration, but the typical form has the column of a greenish ground, upon which are irregular streaks and splashes of dark crimson, whilst the suckers are grayish. The tentacles are more or less pellucid—usually more when they are fully expanded—and marked with transverse bands of opaque white, purple, or crimson. They are conical, very stout at the base, and perforated at the tip, through which they often eject a jet of water. The broad disc is finely decorated, the ground colour olive-green, across which there run from each outer tentacle a pair of dark crimson lines, which pass beside the inner tentacles and run away to nothing on their road to the crimson mouth. The Dahlia is not easily moved without injuring his base, and when that happens he readily mortifies; but sometimes he may be found upon stones not too large to allow his corner to be chipped off. It must be confessed that, in spite of his handsome appearance, the Dahlia does not make a good subject for aquarian treatment, except where there are large, roomy tanks. He is a gross feeder, and there is consequently a greater probability of fouling the water containing him. As a rule, after he



Glaucous Pimplet. *Arrow Muzzlet.* *Opelet.* *Gapelet.*

has been in captivity for a few hours he will turn out the remains of his last meal, and so give you a gentle hint as to the scale upon which provision should be made for his comfort. There will probably be the shells of two or three dog-whelks, a small crab or two, a piece of seaweed coated with *Flustra*, the remains of some sea-worms and prawns, and on one occasion I noted a considerable piece of samphire, upon which the Dahlia's digestive fluid had been poured in vain. Such experiences lead me to suggest that if the Dahlia is to be admitted to the aquarium, let him first spend two or three days in quarantine in a small vessel whose water can be changed several times during his brief stay. By this plan some trouble and annoyance will be obviated.

Quite a different character from the Dahlia is the Opelet (*Anemonia sulcata*), offering, in fact, a strong contrast at nearly all points. The Dahlia settles upon a suitable pitch and stays there; the Opelet has no fixed address. He is the most restless of the whole group in an aquarium, and in the free life of the sea he is equally hard to please. When young you may find a dozen Opelets in a row, and almost in contact, filling a crack in a rock pool, unseen by the multitude because their vivid green tentacles pass for seaweeds.

But when one's base has attained to about three inches across he takes the opportunity afforded by high-water to float out of his pool and start upon his adventures. He accomplishes this by inflating the whole of him with water to such an extent that you may almost see through him, and he becomes as light as the water around him. This accomplished, he looses his hold upon the rock, and floats base upwards to the surface of the sea, then slightly hollows his base boat-fashion, and allows the movement of the waters to take him to a fresh resting-place. Supposing he has been growing among bright green weeds in the pool, his tentacles will be coloured to match, with lilac tips. In all probability when he floats away he will drift against the floating blade of one of the great oar-weeds, and will there attach himself again. His lilac-hued or flesh-tinted column is already fairly in harmony with his new surroundings; but this, as well as the tentacles, will soon become pale brown, when he will be almost indistinguishable. The Opelet's tentacles, of which a full-grown specimen has about 180 in four cycles, are very long, very slender, round and tapering to the tip, never withdrawn, but always in a state of snake-like movement. As we gaze upon it we feel sure that the inventor of

the myth of Medusa's head of hair consisting of writhing snakes must have seen the Opelet. The only periods of stillness are when the ebbing tide has left the anemone stranded and looking like an objectionable mass of dead worms, and when it has eaten not wisely but too well, and has a manifest attack of indigestion. Then also the tentacles droop limp and flaccid, twisted and ragged, as though they had suffered indignities at the pincer-claws of crabs. These tentacles, in addition to their power of curling round their prey, also attach themselves by emitting stinging threads, as in the other species. A fish as large as the Opelet can accommodate with difficulty inside may be killed with scarcely a struggle by mere contact with these writhing, snake-like tentacles. The Opelet is the species which Gosse declares forms the principal ingredient in the composition of the dish called *rastegna*, beloved in Provence, and of which he was able to speak approvingly from experiment. It is difficult to account for one's gastronomic prejudices, but though a confirmed eater of "toadstools" myself, I have never felt drawn to making a meal of Opelets or other anemones. An admirable portrait of the Opelet occupies the centre of the illustration on page 200.

The crannies and pools at our feet are tenanted

by other species of anemones, but I must content myself with calling attention to the remaining figures in our illustrations, of which two or three may still be reckoned among the fauna of the rocks and pools around Portcurnick, where we now stand, whilst for some we must search further along the coast, and in some cases must get into deep water.

The striking anemone with the penthouse arrangement of the tentacles, in the illustration on page 200, does not occur in this district, but in the deep waters off our northern coasts. It is the Gapelet (*Stomphia churchiæ*), whose pellucid yellowish whiteness is boldly and strikingly streaked with rich scarlet on the column and tentacles, whilst the mouth is outlined with the same tint "like the nectary of a narcissus." The disc and tentacles assume various forms, and are as likely to occur bell-shaped as cone-shaped.

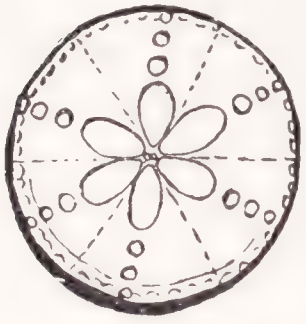
Below the Opelet, in the same group, is a pear-shaped anemone known as the Arrow Muzzlet (*Peachia hastata*), a pellucid flesh-tinted creature that bores into the sand with its hinder part, and which was discovered on the shores of Torbay by the Rev. Charles Kingsley little more than forty years ago. The tentacles are marked each with a double row of arrow-heads in deep brown, and the mouth has a

many-lobed supplement known as a conchula. At the foot of the drawing is a specimen of the Glaucous Pimplet (*Bunodes thallia*), which has a grayish green column regularly studded with dark warts, and

The Gem Pimplet (*Bunodes verrucosa*).

olive-faced gray tentacles marked with opaque white spots. It is not a widely-distributed species, but there is a far more plentiful one of the same genus here at our feet at Portcurnick. This is the Gem Pimplet (*Bunodes verrucosa*), with a flesh-tinted

column covered with rounded warts of various sizes and colours, but definitely ranged in vertical rows. Its tentacles are pellucid gray, with large white spots, and the disc exhibits a star-like pattern of red, blue, and yellow on a black ground. It is found in rock pools and shallow water generally, but until pointed out is very easily overlooked, its colours and markings harmonizing so well with the sandy bottom. It is a beautiful species, and one of the most easily removed without injury.



Larva of Bunodes verrucosa, with tentacles withdrawn.

In the background of the illustration on page 191 is a figure of the Pallid Anemone (*Sagartia pallida*), a local species discovered at Dartmouth more than forty years ago, but of which little is known. Our final illustration, to which I have not yet referred at all, includes two species that may easily be confounded until they are carefully examined and compared. The larger upper figure is the badly-named Daisy Anemone (*Cereus pedunculatus*), which is abundant in all the pools hereabout, though one who is only just scraping acquaintance with the anemones may search in fifty pools before he can see one Daisy Anemone. It grows

among weeds, with the tentacles all directed up to the light, so that on looking down into the pool only the tips of these are seen, and they look so like the clustered branches of seaweeds that the anemone escapes notice. It is shaped like a graceful epergne with a footed stalk, the column gradually swelling upward into the exceedingly broad disc, which, though perfectly circular, is in large specimens so folded that it appears to have four large lobes. The general colour is a warm dark brown with a few variable light spots upon the tentacles and on the lips, whilst very fine lines of red from the base of the tentacles half cross the disc. The upper part of the column is studded with suckers, to which gravel becomes attached, so that when the anemone withdraws its tentacles, and folds up its disc, a little heap of gravel is seen, as in the case of the Dahlia. The other species is the Cave-dweller (*Cylista undata*), of which, however, a variety is shown—not the normal form. Its general appearance, as already indicated, is superficially like the last-named, but examination will reveal a more or less distinct B in black at the foot of each tentacle. This is an exasperating species to obtain, for, though its disc is near the bottom or side of the pool, you find that the column is wedged

Daisy Anemone.

Cave Dweller. *Cloaklet Anemone.*

in a narrow hole or chink, and the base attached at a depth of three or four inches. It is more easy to destroy it in getting it out of its hole than not to hurt it.

Our remaining figure is of a species called the Cloaklet Anemone (*Adamsia palliata*), from its habit of wrapping its column—which is all base—around

the mouth of a mollusk's discarded shell in which Prideaux's Hermit Crab has taken up its abode. There is a partnership between these two—one of several such arrangements between crabs and anemones to which I have referred in another place (see page 94). This species spreads out into two ample lobes of white, spotted with purple. The tentacles are small and white; it gradually dissolves the mineral matter in the molluscan shell and renders it soft. It only occurs in deep water.

Here, then, my sketch of the sea anemones must end, not because the material is exhausted, but the space in which it may be set before you; slight as it is, I trust there is sufficient to show that a holiday-maker endowed with eyes may spend an hour pleasantly and profitably by loafing on the rocks hunting for anemones.

XIII.

TWO UPRIGHT FLATS.

SO much has been written in eulogy of the glorious colouring and remarkable forms of tropical fishes, and especially of those that haunt the coral reefs and atolls, and browse upon the living coral, that we are in danger of overlooking the fact that our own seas contain fishes that are both singular—even grotesque—in form and brilliant in colour. Our food-fishes are perhaps too uniformly silvery gray or ruddy brown to attract much attention to their beauty, especially as they are unknown to the majority of our people, who do not see them, in the inland towns and cities, until their brilliance has in large measure departed for ever. But among the rarer forms even of our food-fishes there are some fine examples of strong coloration and bold contrasts, as well as of quaint

and tropical-looking form. The two things are combined in the various species of Gurnards, the Dory, and the Boarfish. It must, however, be admitted that these are fishes that have their headquarters in warmer seas, and are here found chiefly on our southern shores.

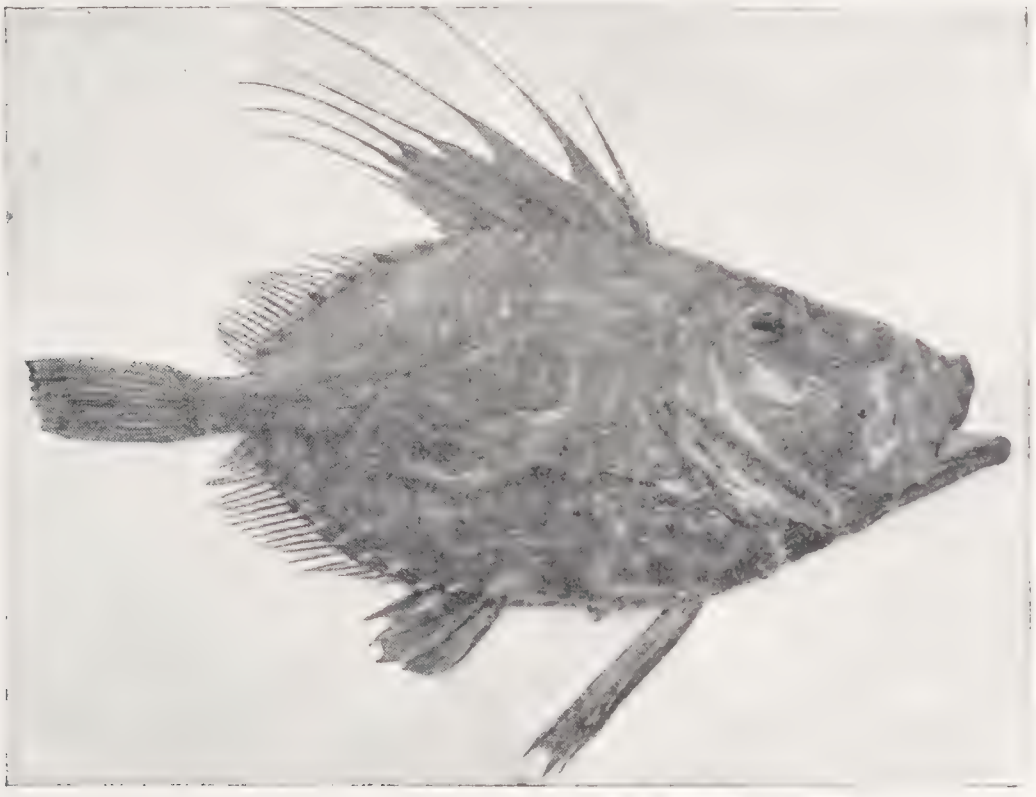
Not the least singular among these are the John Dory and the Boarfish, which may be popularly described as upright flat fishes, though they are not regarded as "flats" by ichthyologists. There are considerable structural differences between these and the true "flats," though the last named swim uprightly in the early stages of their development, when they have an eye on each side of their heads. The sole, plaice, turbot, etc., early take to the horizontal position, and develop protective coloration, the better to elude their enemies and delude their prey; for which purpose they lie on the sandy bottoms, and the eye that is on the lower side gradually travels round until it is on the upper surface beside its fellow. The Dory and the Boarfish, on the contrary, maintain the upright position, when, thanks to their greatly compressed form, they are able to swim through narrow spaces between rocks and weeds on rough ground, and so come

quietly and suddenly upon smaller fishes without exposing their presence in time to enable their prey to escape.

The John Dory (*Zeus faber*) is a fish whose name is more familiar to the multitude than its form—more from reading than from meeting the fish at table—for a considerable quantity of ink has been shed in explaining the derivation and significance of its names. Its popular designation is said to be properly written *Jaune dorée,* in allusion to the yellow and dull gold colouring assumed by it. Others regard it as a corruption of *Il Janitore,* the Door-Keeper, by which name it is known along the Adriatic, and which, apparently, has connection with St. Peter, the legendary door-keeper of heaven, for it is sometimes styled St. Peter's fish because of the black mark on each side. As in the case of the haddock, these spots are supposed to have been made by the finger and thumb of the apostle when he took up the fish that had the tribute-money in its mouth. The ancients regarded it as a fish sacred to Zeus, a circumstance commemorated in the scientific name of the genus. They also called it the Smith (*faber*) and Coppersmith (*chalkeus*), the latter probably referring to the mixture

of copper and soot in its colouring. The reader is at liberty to retain as much or as little as he pleases of these explanations and derivations.

The singular aspect of this fish is partly due to the distance between the mouth and the eye, which



John Dory (Zeus faber).

gives a disagreeable expression to the face; and partly to the large size of the head, which is one-third of the entire length, and very nearly half of the body proper. This last is a feature which strikes the thrifty housewife unpleasantly, for in preparing the Dory for the table, the head, tail, and fins being cut away, the

remainder is a very small matter. But the great development of the first back (*dorsal*) fin is what at once engages attention, more especially in a full-grown specimen. The fin-rays themselves are very long, but from these spring much longer streaming filaments, and it has been said that the Dory uses these somewhat after the manner of the Angler-fish with the fishing-rods upon his head. This statement was made by Jonathan Couch, on the testimony of fishermen ; but I think it is open to serious question, as the filaments float the wrong way to serve as baits. The Dory is a slow-moving fish, and, supposing he felt a nibbling at one of his lines, he could not turn with sufficient rapidity to secure the nibbler. It is more likely that the waving of these streamers has its part in the general effect produced by the coloration and the indefinite markings of the body, which must harmonize splendidly with the brown and olive weeds where it is said to seek its food. That it does for the most part resort to the rough ground at the bottom is proved by the fact that it is chiefly captured in the trawl and the trammel, though it may also be taken in mid-waters by baiting the hook with a small fish, such as a chad or pilchard.

As already indicated, the movements of this fish

are not very rapid; in truth, it appears to cultivate sloth as a fine art, and to depend largely upon its sluggishness for success in satisfying the demands of appetite. Mr. J. T. Cunningham, who observed its behaviour in the aquarium of the Biological Laboratory at Plymouth, tells us that it does not overtake its prey by superior swiftness, as does the mackerel, or lie in wait for it like the angler; but stalks it, and approaches it by stealth. "The Dory places itself end on towards the fish it desires to devour, and in this position it is evident that it excites no alarm on the part of its prey. The appearance of the Dory seen in this way is a mere line in the water, to which no particular significance can be attached.....The movements of the Dory are very gradual except in turning: it alters the position of its body by a turn of the tail or side fins, and then slowly swims forward by vibrating the second dorsal and ventral [fins], a movement which causes very slight disturbance of the water." It has a remarkable mouth, and the extent of its ordinary opening is seen in the photograph; but, when occasion requires it, by the spreading out of several folds or plaits, it can prolong it and increase the opening to such an extent that it can swallow a fair-sized

pilchard or herring. By the sudden expansion of these telescopic jaws when it has approached near to its prey, it is at once brought closer, and the mouth is made large enough to encompass the victim.

A living Dory is a fine, striking fish, but as life passes from him so do his colours fade, and he becomes pale; but when entirely lifeless the yellow and copper and blue return, though not with their former brilliance. We have watched this change of colour in Dories taken from the trammel and thrown into the bottom of the boat. At first the fish exhibited manifest anger at being kept out of its proper element, elongating its jaws, puffing up its body, and grunting out its disgust audibly. This last habit is one that appears to have escaped the notice of writers; but the Dory must be included among those fishes that have the power to utter sounds, which are probably caused by the emission of air from the swim-bladder.

Although much has been done in recent years to make us acquainted with the life-histories of marine food-fishes, the Dory is one of the few that have hitherto eluded observation of its earliest stages. The egg is at present unknown, and there is a good deal of contradiction respecting the spawning period; the late

Mr. Matthias Dunn of Mevagissey holding that it spawns in winter, whilst Mr. Cunningham is of opinion that the ova are shed about midsummer. Probability is all in favour of the latter view, for it is based upon the examination of fishes in spring, when the roe was found to be ripening, and in autumn, when it was found to have been shed; also upon the progressive sizes of young fishes at successive periods of the year. Dories attain to a length of about twenty inches. Couch records a specimen measuring 22½ inches, and another, he says, weighed 18 lb. Cunningham appears to have combined these figures in one individual, for he says, without quoting Couch, "The largest specimen was 22½ inches long and 18 lb. weight." The full size is attained in three or four years. Dories are plentiful on the coasts of Devon and Cornwall and up the Bristol Channel, as well as around Ireland; but on the north and east coasts of Britain they are rare.

The only fish we have in British waters that at all resembles the Dory is the Boarfish (*Capros aper*), which is by some authorities placed in the same family, whilst by others they are separated. This is even more local than the Dory, and of comparatively recent addition to the list of British fishes.

It was first made known as such by Dr. Boase, who took it in Mounts Bay in the year 1825; and solitary individuals were taken in the Channel at intervals during the next fifteen years, chiefly on the coasts of Devon and Cornwall. In 1843 a number were obtained by trawlers on the Cornish side of Plymouth Sound, and in the following year a couple of hundred were obtained within a fortnight by trawling round the Runnel Stone near the Land's End. During the following twenty-five years there were few records of its occurrence; but from the year 1873 it again became fairly plentiful between the Start and the Lizard, and more especially near the Dodman. So it continued until the early part of 1879, when a severe east wind blew along the Channel with most disastrous effect upon the poor Boarfish. Hundreds were cast upon the shore dead, and they have since been found only in summer and in deep water, where they swim near the bottom. They are chiefly taken in the trawl, but several specimens have been brought to me that were caught in the trammel-net.

The general appearance of the Boarfish is somewhat suggestive of the Dory, though the head is not nearly so massive, and the first dorsal fin is without the streaming filaments that are so characteristic of

the Dory. It is also without the elaborate markings of the Dory, and is plainly but gloriously clad in a silky coat of vermilion-orange. Stroke its sides from head to tail, and you get the impression of silkiness; reverse the operation, and you might as well be stroking a teasel-head the wrong way. The explanation is found in the structure of the small scales with which it is covered. Individually these measure about $2\frac{3}{4}$ mm. across the longest diameter, and the hinder portion gives rise to a double series of fine, rounded and polished, slightly curved flinty spines. The bare portion is covered by the overlapping of the next scale. The mouth of the fish is, if possible, even more intricately folded up than that of the Dory, and equally serves for large or small prey. Couch appears to favour the notion that its food consists exclusively of small crustaceans; but a creature with an adaptable mouth like this must also use it frequently for larger prey, or it would soon become permanently small. Its habits and methods of hunting are probably very similar to those of the Dory.

The eye of the Boarfish is very large—in a specimen six inches long it was five-eighths of an inch across. The central portion is black, encircled by a broad band of red. I have never tried the Boarfish

as food, not having obtained a sufficient number at one time; but it is said to be excellent fare. The popular name appears to have been bestowed on account of the pig-like aspect of the extended mouth.

We may note, in conclusion, that Couch's figures of both species are singularly incorrect, that of the Boarfish especially—the general shape being wrong, the mouth wrong, the fins wrong, and the colouring wrong.

Sea Bream. *Surmullet.* *Chad (Young Bream).*
Bass.

XIV.

WITH THE OYSTER DREDGERS.

THE winter visitor to Falmouth who is enjoying the steamboat trip to Truro, or taking the pleasant walk to Mylor by way of Trefusis, will see in the broad waterway above St. Mawes Castle a fleet of small sailing-boats, and a larger number of row-boats, each with winches set up in the forepart. These belong to oyster dredgers, who, with much labour, scrape the bottom with their dredges, and turn over the loose cultch time after time in their search for oysters. The site of this oyster fishery is the Carrick Road, at the mouth of the Truro River, and powers over the fishery are exercised by committees of the Truro and Falmouth Town Councils. The fishery is declared open to the dredgers from 1st October to the last day of March ensuing, but little is done after the end of the year, the results usually not paying

the workers on that date. In truth, it may be said that the first two months are the only lucrative period of the dredging season. Later it is a matter of averaging one or two oysters per haul of the dredge; and it would probably be in the interests of the fishery if it closed on New Year's Eve. During the season there are many days upon which it is impossible to work on account of the weather. Oyster dredging is far from enjoyable when a cold northerly breeze is sweeping down the river, or a nor'-easter cutting across from St. Just Creek, and even a strong southerly wind may make things lively. About half-past seven in the morning, at the end of October, we were at Portcuel, on the river of that name running into St. Mawes harbour. Owing to the windings of this river, Portcuel affords a sheltered anchorage for small craft, and many of the fishermen in the Roseland district keep their boats there, though their homes are on the coast. We were soon running through the loch-like reaches of this picturesque river, past St. Mawes, and looking down the coast to where the masts of the unfortunate *Mohegan* were visible off the Manacles. But our boat's head turned north, and before long we were on the dredging ground, and were greeted with some playful allusions to my presence,

the dredgers asking my friends if they had a new bailiff on board. Truro was our ground, and the moment we had passed the Falmouth boundary the three dredges were thrown out and began to work. After they had been down a few minutes two of them were hauled up, the iron frames brought flush with the gunwale of the boat, the dredge-net emptied out on a kind of shelf running all round the vessel, and the dredge thrown out again. If you had been passing on board the *Queen of the Fal*, I daresay you would have thought oyster dredging a lucrative employment as you witnessed the pile of apparent oysters turned out of the dredge, and thought of the London prices of the delicacies. Alas! the heap consisted almost entirely of old and empty shells that had either been deposited on the estuary bottom as a suitable nidus for the spat to settle upon, or else they were a survival of the good old times when oysters were so abundant here, the prices so low, and the dredgers so few, that some of the bivalves were allowed to grow into really large specimens. That is not so to-day, for the cultch is turned over so many times during the dredging season that the number of legal-sized oysters remaining on the 1st of April must be exceedingly small.

I ought here to explain that it is not legal to take any oysters whose longest diameter does not exceed two and a quarter inches. Each boat carries a metal ring whose inside measurement is two and a quarter inches, and an oyster whose circumference allows it to pass through is not a legal catch. As a matter of practice this ring is not much used, for the eye soon gets accustomed to size in the turning over of the catch, and the small ones are thrown back with the rubbish. Now and then a doubtful one appears, but on testing it with the ring it is most frequently found to be of size. I suppose this method of measuring is the only practical way of preventing over-dredging, but I am convinced that it is not a very accurate plan for keeping the smallest oysters in the nursery. In some oysters the shells increase in size by a pretty equal addition to their margin, but in others increase takes place by a number of slender shoots at intervals straight out from the margin, the intervening spaces being filled up later. An oyster of regular outline two and an eighth inches across slips through the ring, but one whose proper outline is, say, under two inches may just lie on the ring, because it has several of these shoots. Now, in all probability the one that passes through

is older than the one that meets the legal requirements. However, the purpose of the authorities is probably served by securing that a certain number are left to spawn in the following summer, and so to perpetuate the fishing.

Whilst we have been turning over the "cultch" the dredge has been working, and is ready to be hauled again. Here is a pinky-brown oyster attached to an old and heavy shell, which must be separated from it. This is done by a couple of blows with the edge of the cully-knife. Among the mass of rubbish in every haul of the dredge, besides the old shells of various mollusks, are masses of clinker and lumps of coal thrown over by big steamers anchoring in the roads, broken bottles, old boots, whelks, mussels, cockles, horse-mussels, crabs of various kinds. Much of this rubbish has an interest for the naturalist, and you may be sure I was making a few notes that day as well as adding some living specimens to my collecting-bottles. The too-plentiful green Shore Crab was in every haul, many of the females afflicted by the awkward *Bopyrus* parasite. There were great numbers of the beautiful pink Cleanser Crab, and of the Arch-fronted Swimming Crab. Huge Hermits filled full-sized whelk-shells, upon which would be perched

one, two, or three of the falsely-named Parasite Anemones. There were a few small Edible Crabs, Porcelain Crabs, and Plated Lobsters; but most of the smaller creatures slipped through the iron rings constituting the bottom meshes of the net. One minute Hermit Crab I managed to rescue from the cultch before it was thrown back, and it proved to be the comparatively rare Hyndman's Hermit.

Well, our operations all day consisted in throwing over the dredges, hauling them in again, turning over the contents, picking out the few oysters, and returning the cultch to the water. To show how thoroughly the bottom gets overhauled by the great number of dredges necessarily going over the same ground during the season, I may say that several old boots and broken bottles became tolerably familiar that day, though we in no case went twice over the same course. When the cultch is thrown over, it gets dispersed by the currents and the natural tendency of bodies to fall obliquely through the water rather than straight down.

It will be understood that in the sailing-boats the labour of dragging the dredges over the bottom is done by the wind, therefore on calm days operations have to be suspended. In the smaller sailless boats,

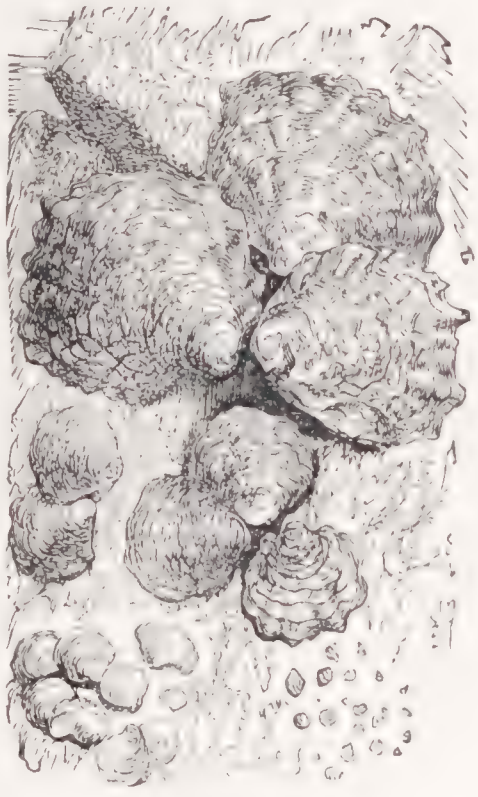
usually worked by one man, the entire labour has to be performed by him; but fortunately he has devised a mechanical arrangement which reduces the work somewhat. Towards the bow of the boat are set up two winches, side by side. Around one of these is wound a slender line, similar in character to that used for connecting crab-pots, and this is attached to a grapnel. To the other winch is fixed a moderate rope whose farther extremity is made fast to the dredge. Across the stern-sheets is laid a broad shelf upon which the contents of the dredge can be turned out. The method of working by one pair of hands struck me as rather ingenious. First we rowed to what was thought a favourable base of operations, and here the grapnel was thrown overboard and the boat rowed away from it as far as the unwinding line would allow. Now the dredge was thrown out over the stern, and by hauling on the winch the mooring line was wound up. As the grapnel had fixed its claws in the bottom and would not stir, the result was the pulling of the boat towards the grapnel, with the consequent dragging of the dredge after us. When we got just over the grapnel the winch was fixed to prevent the line paying out again, and the dredge was then hauled

and emptied upon the stern-shelf. This sounds simple, and so it was in practice ; but it is also hard work when repeated over and over again, all day long, and a man requires to be on the ground early in the season to get paid for his labour. The row-boat men have this advantage over those in the sailing-vessels, that they can work in wind or calm.

If a man is thrifty and a capitalist in a small way he has a chance of making more of his catch than the man who must sell at once to pay his way. The buyers from Whitstable and other places pay the magnificent sum of ten shillings per thousand for these sea oysters, taking them home and laying them down for six months or more in the artificial beds. When they have thus become cleansed from their grossness, due to coarse living on the estuary bottom, they are accorded a patent of naturalization and are ticketed "Natives."

The dredger who is not compelled to convert his catch into ready cash, and has got a bed of his own in one of the rivers or creeks in the neighbourhood, lays them thereon and leaves them for one, two, or three years. Then when the buyer comes along he will pay from thirty shillings to thirty-five shillings per thousand for these larger and cleaner oysters;

but even this enhanced price leaves a very handsome margin of profit for the middleman. With the exception of the narrow upper waters, the whole of the Portcuel River, and much of its tributary Froe-creek, have the bottom covered with oyster-beds, mostly belonging to the dredgers. There are millions of oysters there, worth thousands of pounds, and the beds are simply marked off one from the other by long slender willow shoots that show above the water. Each man knows his own bed, which he rows over, and then throws out the newly-dredged oysters, which fall lightly upon the muddy bottom. This river being perfectly free from sewage matter, the oysters, after serving a period of probation here, are perfectly fit for human consumption without fear of containing the germs of typhoid or cholera.



Oysters.

But the owner of the bed does not take up nearly as many oysters as he lays down. A very low

spring-tide during a period of great heat may kill off great numbers. A low tide and frost would do the same. Happily frost rarely comes here, but after long rainy periods in winter great volumes of cold fresh water come down from the hills and destroy many oysters. Then there are the star-fishes and the shore crabs; the former tearing the valves apart by the combined action of hundreds of weak little sucker-threads, and the latter chipping the edges of the younger shells until an entrance is effected into which the nippers can be introduced. There is also the boring-sponge, that pierces the shell in all directions and makes it too rotten to protect the oyster. The quantity of spat that flows out of this river in summer must be enormous, although the production is much less per individual from those in artificial beds compared with that from the sea oysters on their natural banks. No doubt much of the spat from the Portcuel River goes to improve the natural banks in Carrick Roads.

XV.

A BUNCH OF BARNACLES.

STRONG easterly winds have been blowing continuously for a week past, and the breakers have been piling up great banks of seaweed on the north rocks. Bits of wreckage that have been floating up and down the Channel for months—planks, spars, stern-sheets, hatchways, and other items—come in with the weed; also the bodies of sea-birds that have been exhausted by their battle with winds and waves. Many other things wash in from time to time, and some of our people with time to spare make a practice of patrolling the cliffs, and keeping a keen pair of eyes on the rocks below for jetsam and flotsam. Anything of value must be reported to the coastguard officer, by whom it is ultimately offered for sale by auction, the salvor getting a definite proportion of the proceeds.

I do not know whether Dick had been wrecking—as this look-out business is called—but this morning he brought me a black pint bottle, such as commonly contains ale or stout. He said he was crossing Portcurnick beach when it washed in at his feet, and he had brought it along, thinking it would interest me.

Perhaps you have already jumped to the conclusion that you are about to hear how I broke the bottle and extracted a paper telling of disaster—shipwreck and dreadful suffering for the handful who escaped drowning, only to die of starvation a little later? But I have no such story to tell. The bottle, though tightly corked, was quite empty, and it was clear that some jocular passenger had hurled it from yacht or steamer with a view to deluding the finder. In what then did the interest consist?

It was entirely external. The cork and the neck of the bottle were invisible, hidden away under a mass of writhing necks and flattened oval heads—a great bunch of barnacles.

This Common or Ship Barnacle may be regarded as a thorough vagabond of the sea; not one that wanders by its own physical exertions, but a crafty creature that has discovered how to use the higher

animals in making its way through life. In his younger days the Barnacle explored the world of waters by paddling his own canoe; but possibly coming to the conclusion that more time could be devoted to the pleasures of eating if he made use of the energies of others, he flung away his paddles.

First, however, he looked out for a suitable conveyance, though he was not particular whether it was the fin of a shark, the back of a whale, the shell of a turtle, or a piece of wreckage. In the case under notice this bottle was flung overboard, and floated sufficiently deep to allow our infant Barnacle to reach the top of the cork, where he was soon joined by others, all of whom became permanently fixed to the cork or the neck of the bottle. Every one then changed his form, and became a miniature representation of the adult forms now crowded on the bottle.

If we select one of the largest of these for closer inspection, we find that at the free end of the soft, leathery stalk there is a white and blue shell of five pieces. Within this shell is the body proper of the Barnacle. It lies on its back with its long, curled-up legs towering over its mouth. There are six pairs of these legs, and each one forks into two

dark purple, jointed branches, which bear fringes of bristles and fine hairs. When the whole twenty-four branches are extended plume-like beyond the opening of the shell, they form an extensive net

Ship Barnacles.

which sweeps up small creatures from the waters, and carries them to its mouth. As these limbs make their sweep they curl up from the slender tips, and remain so curled when the shell is closed.

This prettily tinted shell would lead us to suppose

the Barnacle is a near relation of the mussel and the oyster, but the naturalist assures us it is more closely connected with the crab and the lobster. If we take off one side of the Barnacle's shell, and so reveal the creature, we shall see that it has complex jaws like those of the crab; and if we turn the creature round, so that the mouth occupies a similar position to that of the crab, we shall find that the limbs and shell are also in natural positions for a crustacean.

In the early stages of its existence, before it became attached to this bottle, the Barnacle presented such close likeness to the baby forms of many of the crab tribe, and to the adult forms of some, that we cannot doubt the relationship. On emerging from the egg, the young Barnacle resembles one of the minute crustaceans called Water-fleas, and is then known as a Nauplius. It is pear-shaped, with a pair of appendages extending backwards from the shoulders, so to speak. There are two pairs of branched swimming legs, a pair of feelers, with a single eye-spot midway between them, and a beak-like mouth. It swims freely, eats with good appetite, and to such good purpose that it rapidly outgrows its crystal shell, so that several times it is compelled to throw this off and secrete

a newer, larger one before it reaches the pupa stage and is called a Cypris. When it attains to that condition it is encased in a two-parted glassy shell, in shape somewhat like that of a mussel, and in this is stored up a supply of nutriment sufficient to sustain life through this stage, *for the Cypris has no mouth!*

But the single eye of the Nauplius has increased to a pair in Cypris, and these are of more efficient character than before. The feelers, too, are more complex, and at their base are glands which secrete a liquid cement; the swimming legs have increased to six pairs, which work between the valves of the shell. Its structure indicates that it must now waste no time in feeding, but must make use of its pair of eyes for the discovery of a resting-place, and use its additional paddles to convey it to the desired spot.

Having chosen a site, the Cypris appears to be examining it intently, but a liquid cement is flowing freely from the glands, and fixing the creature for the remainder of its life. This final settlement accomplished, a rearrangement of organs follows, to fit the altered conditions.

A special shell-gland sets to work to provide the

five-parted shell, a new and better mouth is formed, the legs become converted into the plume-like hand with which to keep the mouth well filled, the two compound eyes again change into one of a simple character, and the feelers become merged into the growing stalk below the shell.

Thus we have got back to the adult condition from which we started, and though the Barnacle will grow to be more than twenty times its present size, it will not again alter its form or habits. I have before me, as I write, specimens measuring two millimetres only, with the merest indications of the stalk; but the largest individuals in the photograph have shells measuring four and a half centimetres, in addition to a stalk ten centimetres or more in length. The Barnacle, tired of carrying itself about the ocean-world, has devised this method of retaining a vagabond existence without exertion, beyond what is required for snatching its meals from the waters.

Unlike its relations, the Acorn Barnacles, that cover our rocks between tide-marks and are fixed to immovable sites, the Common Barnacle may make several voyages across the Atlantic during the course of a single year. When we compare these two together, we are struck by the fact that the vagabond

is a bigger, more prosperous-looking individual than the dull-looking vegetative Acorn Barnacle, which is merely one of many thousands crowded together on a few feet of rock-surface, and never changing their position. There can be no doubt that the power of sweeping a greater circle of water at a distance from its base, which the long, muscular stalk gives, accounts for much of the Ship Barnacle's extra prosperity.

Crabs and lobsters grow too large for their shells, and, owing to the peculiar shapes of these, they cannot be enlarged, like those of oysters and snails, by the addition of fresh shelly matter to their edges. The difficulty is solved by throwing them off entirely, together with all the internal shelly parts, and the excretion of a more roomy suit of mail.

It is curious to note that the Barnacle follows the plan of the oyster in enlarging its shell, by adding new material to the old margins; but in spite of this it feels compelled, as a crab-like creature, to get rid of some of its wraps, so we often find floating in sea-water almost transparent, ghostly representations of the shell contents, including the bristly curled feet.

Of the scientific names of this Barnacle, the first word—*Lepas*—is that used by the old Greeks for the

Barnacle and the limpet; the second—*anatifera*—is Latin, and signifies "goose-bearing," which may appear enigmatical to those who have never made the acquaintance of John Gerard, a sixteenth-century naturalist, whose "Herbal" is well known. One portion of his book has been quoted almost *ad nauseam*, yet

Ship Barnacle (*Lepas anatifera*).

the story is so quaint and fanciful that reference to it appears almost a necessity in any writing concerning the Barnacle.

It would appear that some mediæval artist had drawn a picture of a bunch of Barnacles growing from a piece of timber, much as our colony is

growing from the bottle. Then I should suppose that another artist, copying from him and not understanding what he copied, had made it more tree-like, giving the stalks of the Barnacles the aspect of branches terminating each in a large fruit, and with leaves added. There are several mediæval cuts representing this phenomenon. Most of those who told the story gave it as an item of common knowledge, but John Gerard, quoting the apostle, went further, and said, "What our eyes have seene and our hands have touched, we shall declare," and proceeded to give a minute account of the evolution of the Bernicle Goose from the Barnacle.

Gerard describes the "trunks and bodies with the branches of old and rotten trees, whereon is a certain spuma, or froth, that in tyme breedeth into certaine shels, in shape like those of the muskle, but sharper-pointed," etc. "At short space after it commeth to full maturitie, and falleth into the sea, where it gathereth feathers, and groweth to a fowle bigger than a mallarde and lesser than a goose, having blacke leggs and bill or beake, and feathers black and white, spotted in such a manner as is our magpie." After stating that the finest specimens might be bought for threepence, he anticipates scep-

tical comment, and quashes it in advance by saying: "For the truth hereof, if any doubt, may it please them to repair to me, and I shall satisfie them by the testimonie of good witnesses."

This explains how the Barnacle got its name *anatifera*, and its retention at the present day is sufficient proof that matter-of-fact science is not altogether opposed to the survival of romance.

XVI.

MY FLOATING ISLAND.

MY island is of fairy-like dimensions, measuring only four inches in length by an inch and a half broad, with an entire thickness of an inch. It floats on a miniature sea confined within the walls of a small aquarium, and is of such aspect that most of my readers would unhesitatingly fling it upon the rubbish-heap. And yet it is covered with so many wonders that an enumeration of them would make too long a chapter; so I must be content with describing just a few of its inhabitants.

The island is in truth a flat piece of cork which was attached, at the beginning of the crabbing season, with a number of others, to a long line to act as floating marks, showing where a series of crab-pots had been sunk. The other day Joe and his partner came to the conclusion that crabbing had become so

"slight," as they expressed it, that they had better bring in their pots and store them for the winter before the gales swept them all away. As they were hauling them in, Joe took one of the corks in his hand and remarked, "Shouldn't wonder if Mr. Step would like one of they old corks; he'd find some curios on they, sure 'nough!" So one of *they* was saved for me, and "sure 'nough" when I floated it in water again there were plenty of "curios" revealed —many more than Joe had ever suspected to be lurking in its crevices.

First of all, attention was attracted to the Acorn Barnacles, for they immediately opened the double doors of their houses and began their never-ceasing occupation of grabbing handfuls of sea-water and straining the microscopic life from it. There were Saddle Oysters, which are commonly mistaken by fishermen for the young of the real oyster, though a slight examination would reveal a striking difference. In the lower valve of the Saddle Oyster's shell there is a large hole through which a plug-like muscle passes, and so attaches the creature to the base it has selected for a residence. More interesting were the young Quins, because soon after getting into their new quarters several of them quitted their hold of the

island, and went flitting rapidly through the water with the erratic movements of a butterfly. They effected this flight by the rapid alternate opening and closing of their shells. These young Quins are very beautiful objects as they lie close to the aquarium glass, with their valves gaping slightly and the opening curtained by the delicate fringe of the mantle, which is jewelled by a series of bluish-black eye-like beads, surrounded by long, slender, waving tentacles. In certain lights these beads show opalescent gleams, and when light is directed upon them they flash and glitter.

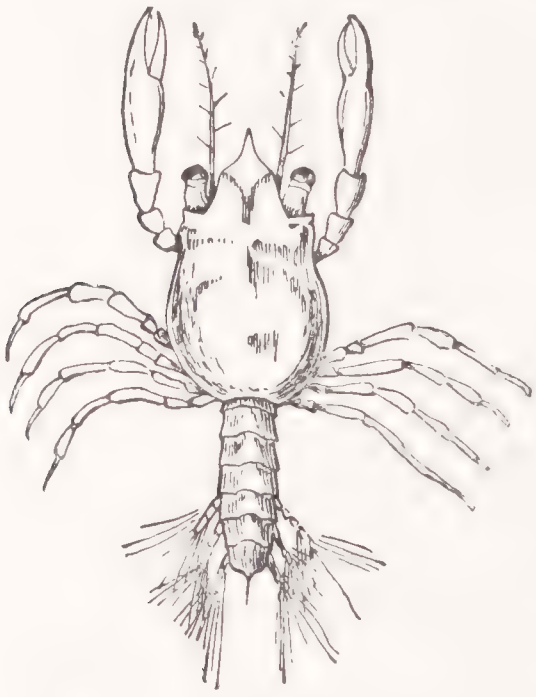
I shall not soon forget the astonishment and admiration of two of my fishermen friends to whom I was showing various marine creatures one day. "You have seen the Quins fly through the water, of course?" I inquired. No, they had not, and they smiled sceptically, as much as to say: "None of your fairy tales of science with us; we know all about Quins, and that they lie quietly on their beds like oysters." Then I was about to prod a Quin gently with a little rod, but, as though it read my thoughts, it immediately arose from the bottom of the vessel, and began to flit about from side to side, and from top to bottom, in the queer zigzag fashion peculiar to

Quins. My friends stared at each other, astonished. "Well now! did 'ee ever see the like?" "Wasn't that fine!" and so forth. "Ah!" added one, "that explains how they come to be on our dredge-rope when we're oyster dredging. We could never understand how they could climb up so quickly, and never dreamed they could fly!"

In the crevices of the cork, at different parts of the island, little crabs of a ruddy complexion, with depressed round bodies and long angular nipper legs, were apparently jammed in tightly; but one after the other they emerged to have a look around, and observe what kind of a sea their island was now floating upon. Viewed in full daylight, they proved to be examples of the small Porcelain Crab, a species to be found sparingly by diligent seekers in the crevices of rocks at low-water, but occurring more plentifully in deep water. It has been especially built to enable it to sidle into narrow chinks, and it sometimes gets into places that are not over-clean. It is amusing to come upon this crab when he is intent upon cleaning himself up after a sojourn in some muddy corner.

Porcelain Crab.

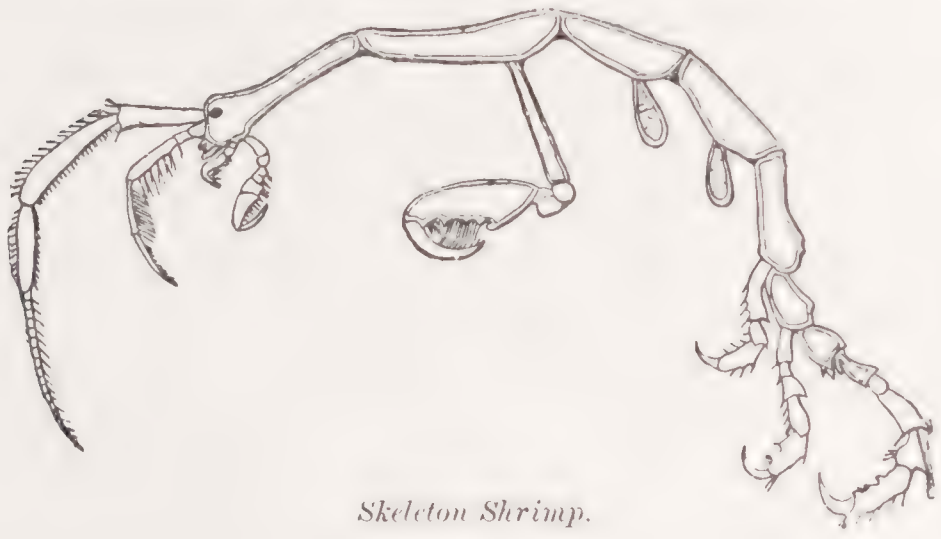
He is provided with a pair of brushes for this contingency, and he applies these with energy. Look at the sketch of him, and you will see that his brushes are mounted upon long handles, to enable him to reach far across his back and along his limbs. They are, in fact, his hindmost pair of legs, made particularly slender and mobile, with the tips modified into little brushes for this particular office. I have alluded to the ruddy colour of the specimens dwelling on the island, which was an adaptation to the colour of the cork; but it varies greatly in this respect, and the individual that sat for his portrait was coloured a dirty white, with a dark-brown patch to the rear.



Larval form of Swimming Crab.

Then there were several transparent lobster-like creatures about an eighth of an inch long, with big blue eyes and long tails. These could swim admirably by beating the water with their tails and large claws. In the course of a few days they had cast their crystal cases and assumed a more crab-like

form, the tail reduced in length and tucked tightly away beneath them as in adult crabs. Again they cast their shells, and the new ones were of a distinctly light-red hue, whilst the hindmost pair of legs had become so flattened out that I knew the crabs belonged to the group called swimming crabs, and later developments showed me they were of the particular species known as the Dwarf Swimming Crab. One



Skeleton Shrimp.

other crustacean was present in the person of the Skeleton Shrimp (*Caprella*), whose body and limbs seem built up of many-jointed white threads, and to recall in a miniature fashion the mantis and stick-insects.

At one end of the island was a small tract of dirty-white jelly, thrown up into hillocks and low pinnacles, each of which lengthened after a little while into a clear crystal vase with a conical cover.

Then this cover proved to be composed of eight triangular flaps, which slowly turned away from each other until the vase resembled a heath-bell, the petals covered with the most delicate transparent hairs, whose movements caused a current of water to flow to the mouth, where microscopic food was extracted from it. These delicate creatures possess the unromantic name of Dead-man's Fingers. Their real nature is similar to that of the better-known sea-anemones, but instead of the individuals being separate, they are here associated in large colonies having a common base. But each is so far independent that it catches and digests food for itself, and subscribes a portion of the results to the common fund.

Here and there on the island were long, tapering tubes of white porcelain, of different patterns, and variously twisted and curved. Some had a rounded surface, others had one or more sharp ridges extending throughout their length, but all agreeing in being tenanted by a tube-worm, whose head was adorned with a most exquisitely-fashioned crown of plumes—some bright crimson, some blue, others parti-coloured of red, white, and gray. These plumes are really the modified tentacles of the worm, serving the double purpose of gills and fishing-net. One tentacle is

always so modified as to form a long slender stalk ending in a stopper, which accurately closes the mouth of the tube when the plumes are withdrawn, as they were with a sudden snap whenever a shadow

Group of Tube-worms.

fell upon them, or any slight jar was given to the vessel. One of these tubes, after creeping along the side of the island to the length of an inch, suddenly doubled upon itself for a third of that distance, then

turned at right angles and stood away from land for half an inch. This tube being round in section, its attitude made it a graceful stand for the display of its brownish plume.

A more remarkable worm had the main portion of its body secreted in some internal cavity of the island. I caught sight only of its head and appendages, but from previous acquaintance with the species under

Tube-worm.

other conditions I knew pretty well how much was hidden. This worm—called *Cirratulus*—is of great length and very soft, of a bright scarlet colour, and clad in a loose robe, from which at intervals iridescent crystal daggers with the keenest of points are shot forth. I said that I caught sight of his head and appendages, but of a truth it was the briefest glimpse possible, so far as the actual head was concerned, for the appendages, in the shape of hundreds of ruddy

locks, completely hid their support most of the time. These filaments were almost as fine as the spider's gossamer, and radiated in all directions, until they practically covered the entire island. When night came on and my room was in darkness, I arranged to have the under-side of the island electrically illuminated for the possible diversion of other inhabitants of the tank. When the time came, by means of a half-broken fragment of bamboo I prodded gently about the under-side of the island until I touched the worm. In an instant the whole under-side of the island was lighted up by pale violet light which flashed along hundreds of fine lines. What the creatures below thought of the display I cannot tell: neither can I surmise to what purpose this illuminating power is applied by the worm, unless it be that a fish having the intention of eating *Cirratulus* might be frightened by the sudden display of this network of fire.

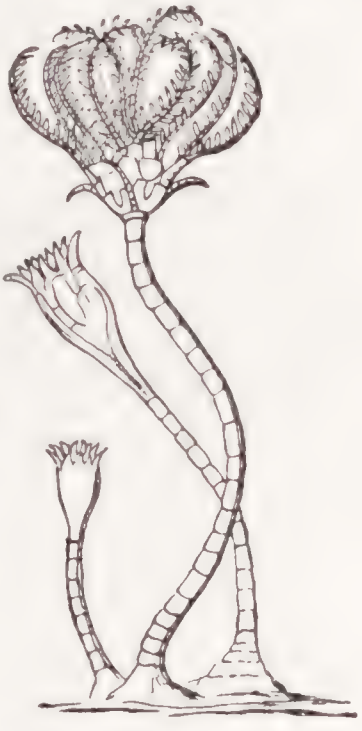
To my mind the most beautiful of the islanders were two small specimens of the Rosy Feather-star, the most graceful of our native species of star-fishes and their allies. It has a small button-like centre, from which radiate five "arms;" but almost immediately after leaving the "button" these each branch

into two, so that the superficial observer would say there were ten long arms or rays. Now these rays are built up of many short, stony joints, like the backbone of a fish, and are furnished with a jointed appendage from each joint. In many of the published figures of this species these appendages are represented

Rosy Feather-star.

as being opposite to each other, but in this respect the figures are inaccurate. It will be seen on reference to *our* figure that these are not opposite but alternate. The whole of this jointed skeleton is covered by a soft fleshy coating, which is coloured deep crimson in some individuals, whilst in others the

colour is in zones of crimson alternating with yellowish-white. Along the centre of both rays and branches there is a groove lined with delicate hair-like threads, by whose constant movement a current of water is kept up to the mouth, bringing minute food-particles with it. The mouth is in the centre of the "button." Properly speaking, this mouth should be underneath, as in all the star-fishes and sea-urchins, but the Rosy Feather-star prefers to remain back downwards. It retains its hold by means of a number of jointed hooks, resembling the claws of an eagle, and these grasp a stone or weed quite after the manner of a bird of prey. But the Feather-star can also swim, and does so by the alternate flapping of the arms, one side at a time. This Feather-star began life attached to the end of a jointed stalk, when it resembled the fossil Encrinites, or Stone Lilies, found so plentifully in certain strata of the earth's crust, notably in the Carboniferous limestones.



Young Feather-star.

Many other interesting creatures there were upon

my floating island, but those I have mentioned were such as would most likely have attracted the attention of the ordinary observer; and perhaps this recital may suggest to my readers that many diverse forms of sea-creatures may be obtained and studied by merely picking up some worthless object that has been long afloat.

XVII.

AN HOUR IN A DRANG.

I AM quite prepared to hear it said that there are actually persons who do not know what a Drang is; but these are not Cornish folk. The word is, I believe, in use among Cornish miners to denote a straight, deep trench, and on the coast it is commonly applied to a long, deep, and straight-sided fissure in the rocks, which looks precisely like human work. In that part of South Cornwall with which I am best acquainted there are a number of such natural excavations, each with its distinctive name. That through which I am desirous to conduct you is the Long Drang, and the illustration on the next page represents one end of it when the waters have ebbed sufficiently to show its position. At high-water you may row over the rocks on either side of it, and at low-water of spring tides

The Long Drang at Low-water.

walk along the bottom of it, and so get an introduction to many things not to be found between ordinary tide-marks. There are usually only about two days in each month when we can set foot in the Drang, unless we wear sea-boots, and not many days upon which even that attire would serve us.

I confess that to those who visit it for the first time the empty Drang does not present a very promising appearance; ruin and desolation appear to prevail. Broken masses of rock are strewn around, the wracks and tangles hang limply from the walls and lie tumbled in heaps on the floor, and enormous opelet anemones, whose hundreds of opalescent tentacles waved with grace and beauty in the water, now lie flaccid and unsightly. But appearances are deceptive, as we learned from our copy-books years ago. Life, not death, is teeming around us. Stand still a moment and listen. "Click, click, click, click, click!" sounds from the rock on the left; there is a half-hissing, half-scratching sound from rocks all around; and every minute or so a rapid, prolonged splashing in one of the pools on the floor of the Drang. We cannot investigate all these sounds at once, but I can tell you what they signify. The "click-click" is caused by the fan-like mechanism in the gill-

chamber of a crab or lobster, which is kept rapidly vibrating. The animal is in a hole in that rock. Anywhere along the Drang you will hear similar music. The hissing-scratching noise is a combination of sounds due to the opening and closing of barnacle shells and the rasping of limpets on the rocks. The splash was caused by the sudden rush through a shallow pool of some rock-fish—rockling, wrasse, or tompot most probably.

We can search for the authors of these noises if you wish, or go on turning stones and lifting curtains of seaweed. You would like to find that crab or lobster? Very well; listen attentively, that you may locate the sound. It comes from the base of the rock, and lifting up a fringe of bladder-wrack, we behold a crab sitting up on his lower edge, so that his whitish under-side, marked with red and blue, is turned towards us, his great nippers, with blue tips, and the coarse velvet, picked out with little polished white bosses, held out towards us either imploringly or in defiance. He is an old male Velvet Fiddler, and from tip to tip of opposite walking legs he can span a good foot. The pliant joints of his limbs are bright crimson, and his gleaming eyes are of the same hue. His back and legs are covered with shabby

velvet, set off on the legs by slightly raised bands of polished black or blue. He is a born fighter, and his attitude just now is an invitation to "tread on the tail of his coat," and see what will follow!

Quite a variety of crabs may be found along this Drang—more species, perhaps, than you imagine are to be found all round these islands. Small specimens of the Great Crab, that we know best by seeing it on the fishmonger's slab and on our tables, are to be found embedded in the sand under most of the stones. Larger examples must be sought in rock crevices, where also we may come across a small lobster. It is one of the drawbacks attendant upon our use of these creatures for food that we become almost blind to their beauty of form and structure. Yet, if we consider the living animals in their natural environment, we cannot fail to be struck by the harmony subsisting between their structure and habits. All crabs are built on one common plan, yet each of our numerous British species differs from the others in

Great Crab.

some one or more points that specially fit it for its peculiar mode of life.

Turn over almost any stone along this Drang and you will find clinging tightly to the under-side a very thin crab known as the Broad-claw, who daubs his upper side and the long hairs that fringe his nippers with mud, so that he looks like nothing so much as a slight irregularity in the surface of the stone. A closely-allied species, the Porcelain Crab, on the other hand, is designed for sidling into the narrowest crevices. Another (*Xantho*), which the coast youngsters designate Devil Crab, has only to tuck his limbs under his body and you pass him by as a polished pebble. You are sure also to come across numerous small examples of the Hermit Crab, whose soft body ending in a long fleshy tail is much desired by fishes as a dainty morsel of food; so the crab has learned to tuck it safely into a discarded shell of the winkle, the top, or the purple. When it becomes too large and conspicuous for shallow water, it retires to the depths and occupies a whelk-shell.

One crab of peculiar form you will find darting backwards with great rapidity in any of the pools on the floor of the Drang, and will probably make the mistake of calling it a young lobster. It is, in-

deed, called the Squat Lobster, but it is really a crab. It may be as well to note that the broad-toothed tips of this individual's nippers can inflict painful little pinches; but if the Squat is seized behind the head by the finger and thumb he cannot well accomplish

Squat Lobster.

this, though he will endeavour to frighten you by flourishing his nippers and flapping his broad tail. This flapping of his tail serves a very useful purpose when the Squat Lobster is in a pool, for by two or three vigorous strokes of it he is sent backwards

through the water, and we are astonished to see with what marvellous precision he finds his way into a sheltering hole by this retrograde movement. In common with those of all the crabs, his eyes are mounted on movable foot-stalks, and by erecting these he can see backwards as well as forwards.

There are many fishes of several kinds in the pools, but these are coloured to harmonize with the rocks or the weeds, and their presence is chiefly made known by their rapid movements from side to side, from shelter to shelter. Among these are the ruddy-brown Rocklings, of which three distinct kinds may be detected by the number of barbels in front of their heads, from which they get their several names of Three-bearded, Four-bearded, and Five-bearded Rocklings. Like the similar organs of the cod, these barbs are sensitive feelers by means of which the Rockling, hunting by night, detects the presence of worms, etc., in the mud and sand at the base of the weed-covered rocks. A similarly coloured ribbon-shaped fish, with about nine black spots along the back, is the Gunnel or Butter-fish, and when you have essayed to capture it with your hands you will admit that the second name is fitly bestowed, for it is more slippery than an eel. Under stones, espe-

cially where the sand is a trifle muddy, you may find several of the Worm Pipe-fishes coiled together. This, the most diminutive of the family—it measures only about five inches long, with a diameter of one-sixth of an inch—is round and hard like a penholder, with a queer little oblique mouth at the tip of a long snout. It has a very poor equipment of fins, because it does little in the way of swimming, preferring to grub about the bottom for its food. The male carries the eggs embedded separately in the skin of its under-side until they hatch.

Then there are Shannies, and Montagu's Blenny, and the big-headed Father-lasher; but these we can find in any of the half-tide pools higher up the shore, so we will not trouble about them now.

There are beautiful sea-anemones in profusion, but until the eye gets used to them you will never see more than the common red and brown Beadlets and the big pink-tipped, green Opelets. Down at the base of the rock-walls, their bodies partly buried in sand, you will find the charming Gem Pimplet, its column exquisitely tinted with pearly-gray, minutely dotted with crimson, and the tentacles barred with black and white. In similar situations you may find colonies of the broad-topped, smoky-hued Daisy, with

streaks of white radiating from the mouth. The gorgeous Dahlia may be found expanded to a width of six inches in some of the pools, but where the water has left it only a practised seeker can recognize it. This is due to its habit of covering its broad column with gravel and fragments of shell, so that when it draws in its tentacles it looks like a little heap of gravel. Several less generally known anemones may be found along the Drang by the patient seeker who can make several visits, such as the Cave-dweller, that fixes itself in deep chinks of rock, and almost defies extraction; the Plumose Anemone, with its tall alabaster column and fringed lobes; and, truest gem of all, the tiny Globehorn, with emerald column and tentacles tipped with crimson balls.

Then there are layers of living sponges, white, yellow, and red, encrusting caverns of the rocks, bits of which we can peel off and, by putting them into our collecting bottles, see the currents of water flowing from their crater-like mouths. Among these is sure to be the Crumb-of-bread Sponge, thus named because of the resemblance of its porous surface to the texture of "the staff of life." Probably in the neighbourhood of these we shall find the largest of our sea-slugs—the Sea

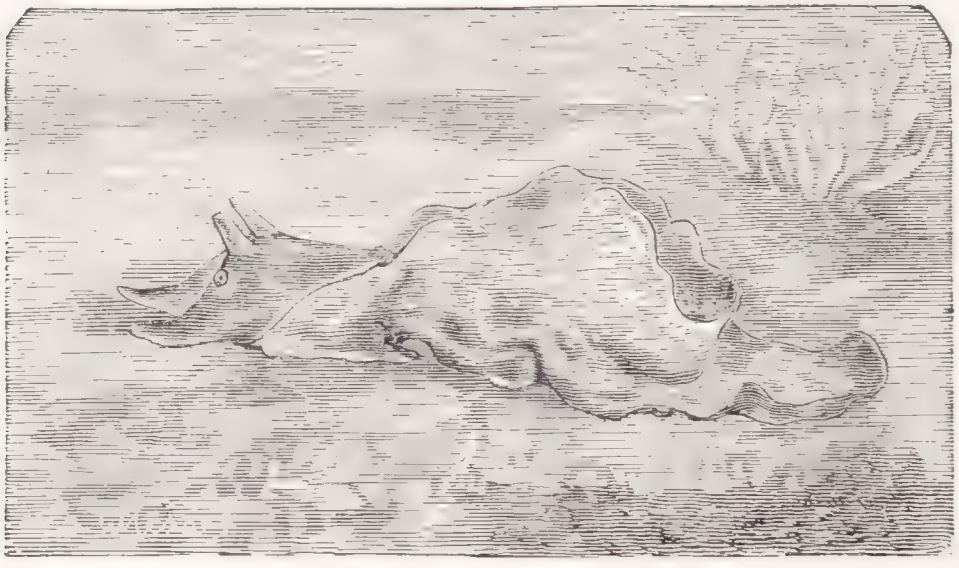
Lemon, so called from its resemblance to half a lemon. Yet, if we see it feeding on the Crumb-of-bread Sponge, we shall not think of this counterfeit presentment, but of its more remarkable mimicry of the sponge. Sponges are not relished by fishes,

Sea Slugs (*Eolis*).

but sea-slugs are, and so large a slug as the Sea Lemon needs protection, so its surface coloration exactly reproduces the surface of the sponge. In all probability you may be looking at this creature on the sponge and yet not see it. Other slugs, such

as the *Eolis*, imitate anemones with spreading tentacles, and like the Sea Lemons prey upon the creatures they mimic.

Another slug of considerable size you will probably find among the purple-brown weeds, with which its own colour assimilates. This is the Sea Hare, a creature that will be identified at once if you catch



Sea Hare.

sight of it from front or back, for its long "horns" or antennæ resemble the ears of a hare in miniature, and immediately suggest a likeness to that rodent. If disturbed, our Sea Hare will probably discharge a purple fluid, which will produce a cloud in the water. This trick used to alarm such of our forefathers as came across the Sea Hare, and they argued

that it must be an evil beast to do such things, and further asserted that if you touched it you would lose all your pretty locks, and be afflicted with baldness! You may take my word for it that this was a gross libel on an inoffensive animal; and should you feel disposed to take it from the pool and transfer it to a glass jar, in order the better to observe it, you will run no risk thereby of having to order either a wig or a dozen bottles of hair restorer. In a young state the Sea Hare lives in deeper water among the red weeds, *and is then red.* As it gets older it comes higher up among the brown wracks, and becomes brown in harmony with them. Finally, it gets into the tide pools among olive and green weeds, and itself becomes in turn olive and green! It is very difficult to distinguish it from part of the weed upon which it rests.

Sea-snails, like the Painted Top, the Purple, and the Pelican's-foot, wander over the rocks; and in the pools you will find the delicate little Cowry, with the orange-coloured filaments of his "mantle" enveloping the fine-ribbed shell. In the sand and gravel little bivalves may be found burrowing. The familiar Five-fingered Starfish will greet us continually, of course, usually engaged in digesting the contents of several Purple shells. But we shall also come across a hand-

somer species, the Glaucous Starfish, with longer, spiny, blue-gray rays, which sometimes attains a diameter of two and a half feet from tip to tip of its rays. Then, among the *débris* of the bottom, there are quaint little wriggling Brittle-stars, and greenish-gray Cushion-stars climb up the rocks.

It is impossible in one brief visit to our Drang to catalogue its living contents. If you should not see all the creatures I have mentioned, you will find others equally worthy of your attention. There are prawns and shrimps of several kinds, many marine worms of marvellous beauty, and the seaweeds!—I had forgotten the charming seaweeds, though they are everywhere about us. But here comes the tide gently racing in. We must clamber out of the Drang, for soon there will not be a foot of the floor that is not covered by water; and in the course of a few hours we may row right across its rock-walls and peep through the clear waters and waving tangles upon many active creatures that are at present in hiding or at rest.

XVIII.

THE ANGLER-FISH.

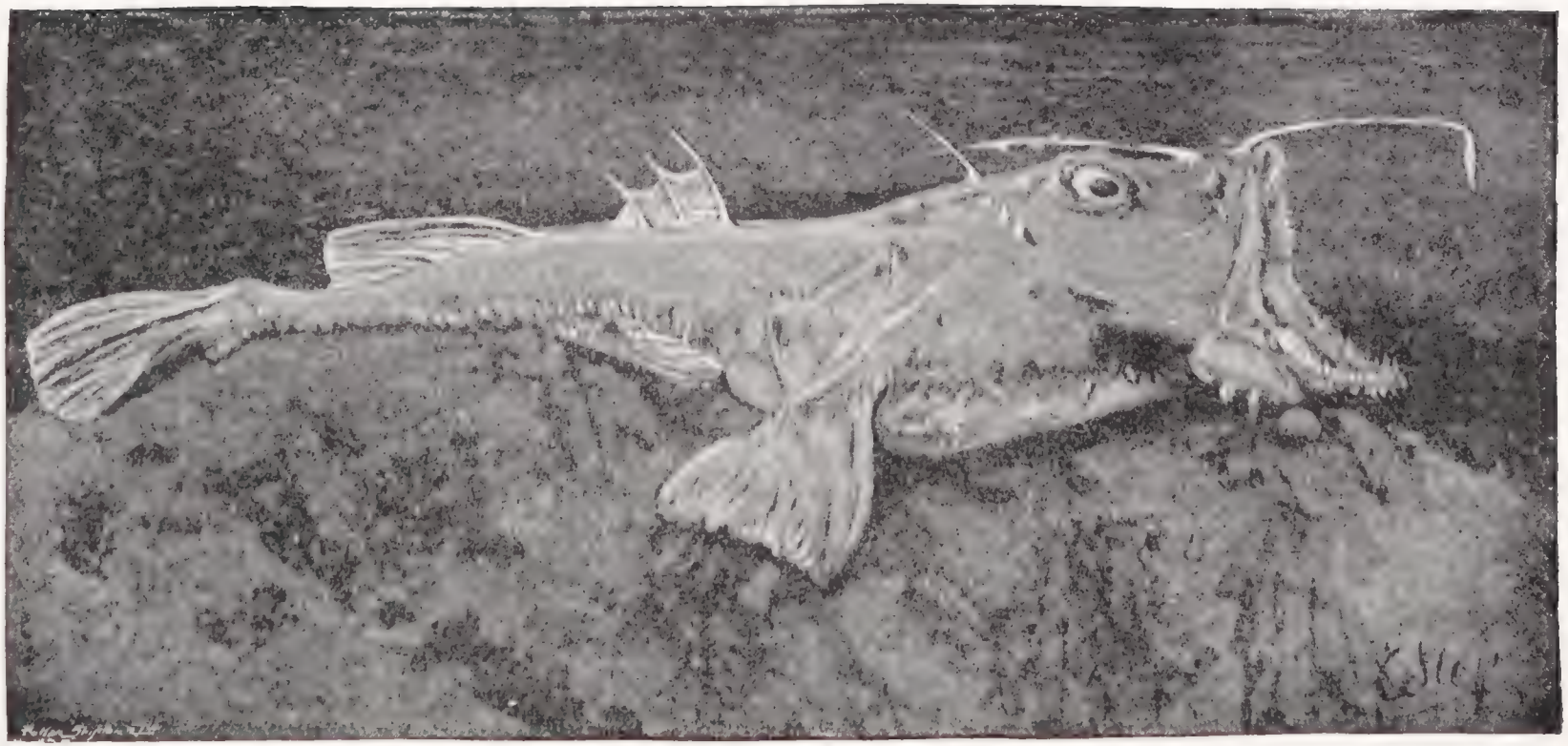
MY tame shag (see page 166) was short of provisions. The weather had been wild, and little fish had been brought in that day. To-morrow would be Sunday, and there was consequently no prospect of supplies till Monday; so I sauntered down to the porth to see if there was any surplus bait hanging up which I could beg or borrow. When the fishermen caught more wrasse or rays than they needed to bait their crab-pots to-day, they cleaned it, split it open, and hung it in a certain place to dry until needed. Alas! the customary hooks were empty this evening, but on going lower down I came across three or four small Anglers or Monks that a fisherman had hauled in his trammel and brought ashore. Finding out to whom they belonged, I inquired if he had any use for them. Yes, he was going to get

some crab-pot bait out of them. "Did you want them?" he added. I explained that Charlie was on short commons, and if he could spare me part that would be of no use as bait I should be glad. "Well," said he, "after I have done with them, I don't think as how they'll be any use to you; but if it's for the shag, why you're welcome to one or two. I've heard a lot about your shag, but never heard of taming one before, though I have of tame gulls. How will this do?"

With two or three experienced slashes with his knife, he had severed the huge bag-like head from the small but solid trunk, stripped off the skin, and with it the entrails, and presented me with a thick mass of flesh about a foot long and four or five inches thick. He said it was unfit for food—at least he had never eaten it, because he had never been absolutely starving; but I fancy a London fishmonger would have little difficulty in getting a good price for it, if he dressed it as my friend did, and kept the hideous head out of sight. I cut it into long strips about a couple of inches thick, and Charlie rushed at it, putting away three lengths and screaming for more. He finished the whole in about twenty-four hours. Now this implied that it was really the good stuff it

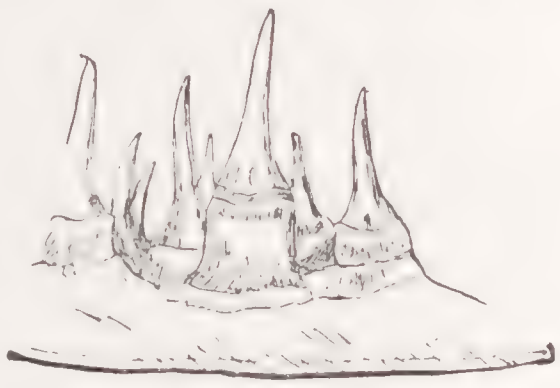
appeared to be, and so bore out the assertions of Couch, Donovan, and Parnell as to its excellence. I understand that this fish, minus the head, is always sold at Grimsby and some other ports, where, to avoid arousing prejudice, it is spoken of as croan and John Dory, though, of course, nobody who had seen the real dory could be deceived by the latter name, the thickness quite preventing that.

Look at the Angler, handle him, and you will readily conclude that he has not been built for a life of activity. He is a heavy, flabby mass, and as you turn him over you might be pardoned for supposing that he possessed no skeleton, and a very poor muscular system. His *rôle* is to lie among the rubbish of the sea-bottom, to flatten himself out as much as possible, and to give his dirty-brown back a close resemblance to a mud-embedded stone. His fins and tail are likewise soft and flabby, and offer no contrast to the general roundness and softness of outline. His under-side is white, but he takes care to keep this out of sight, and along his side all around he has a fringe of fleshy-lobed lappets, which harmonize with the brown seaweeds around him. Oppian says, "This fish is all one vast extended mouth," and for a poet that is, I suppose, a sufficiently accurate



The Angler ready for business.

statement, but for a naturalist it is not. If we exclude the tail from our reckoning of the creature's longitude, about two-thirds of the remainder is "a vast extended mouth"—extended to the width of a foot in specimens of three feet long. The lips are fringed by the fleshy lappets, and the jaws are set with a double—in parts treble—row of long, conical, curved teeth, many of them exceeding an inch in length. There are other teeth set upon the palate and about the entrance to the throat, and all these are so arranged that it is no easy matter for anything to escape when once the jaws have closed upon it.



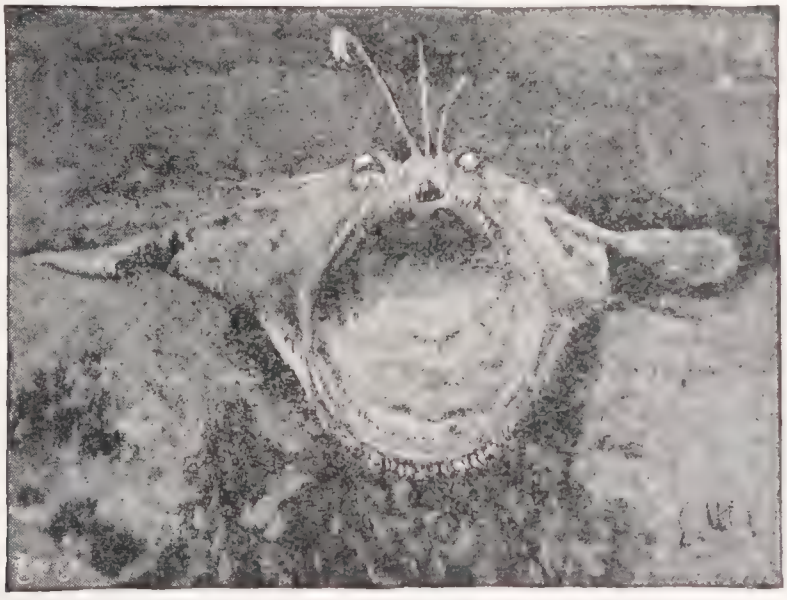
A few of the Angler's Teeth.

On the back of the Angler are two fins (*dorsal fins*), but the first is apparently very short, owing to the fact that three of the six long rays are separated from the others and greatly lengthened. The foremost of the series is placed just above the front of the upper jaw; it is long and flexible, and ends in a narrow piece of grayish skin, like a bait at the end of a fishing-rod. The succeeding rays are without any

such appendage, the second close behind the first, the third behind the Angler's eyes, and the remaining three about half-way along the back. The great breast-fins are developed more like arms, and remind one of the flappers of seals and whales. They are used more as arms, and the pelvic fins as feet, to enable the creature to crawl on the bottom.

The Angler has gotten this one of his many names from the rod-like first ray of his back-fins, and imaginative writers have made good use of this organ. They picture the Angler lying quietly among the rocks and weeds, invisible by reason of its resemblance to its environment, and deftly waving its rod to impart a lifelike movement to the "glittering" bait, "the little membrane of a brilliant metallic lustre," and so forth. Of course, those who thus write have never seen the fish at close quarters, for the so-called bait is of no attractive hue, being dull gray; nor is it at all worm-like, as some have pretended. Misled by the name of the fish, and the similarity between this first ray and a fishing-rod, these writers have relied upon Nature not doing things by halves, and have therefore fancied that the appendage to act as a bait must be worm-like and glittering. They further "give themselves away" by referring to the

apparatus as a fishing-*line*. What is the real use of this contrivance may only be conjectured, for the Angler's habitat is in deeper water than will allow its ways to be carefully studied; but probably the most reasonable suggestion is that the appendage is a very delicate instrument for the purpose of indicating that some other denizen of the deep is in the right position



"One vast extended mouth."

to be grabbed by the jaws. These rays may be touched by a fish in passing, under the impression that they are but the decaying stems of seaweeds, which they much resemble. Colour is given to this view by certain experiments undertaken by Mr. Lane in connection with the Irish Fisheries Survey. He found that on touching the loose appendage with a

stick, the Angler's jaws instantly closed upon the stick with a snap, just as though it were a spring-trap operated by touching a hair-trigger. Several repetitions of the experiment had precisely the same effect, and serve to show that contact with the "bait" is communicated to the muscles of the jaws by means of very sensitive nerves.

From the large number of fishes that have been found uninjured in the Angler's stomach, it is highly probable that digestion is a slow process with it. Sometimes these are sufficiently fresh to be sold without arousing any suspicion as to the method by which they were obtained. Nothing is too large, too hard, too tough for the Angler. Anything touching the hair-trigger causes the machinery of the jaws to act, without any pause to enable the brain to consider whether the substance grabbed at is digestible or not. Thus it has been known to seize the keg-buoy attached to a pilchard-sean, the mass of corks attached to crab-pot lines to mark their location—in this case it choked the glutton—an iron grapnel, a large gull, a northern diver, and the head of a mop. There is no doubt at times it leaves the bottom and takes heavy and short upward flights, as is proved by its acquisition of the keg-buoy, the crab-pot floats,

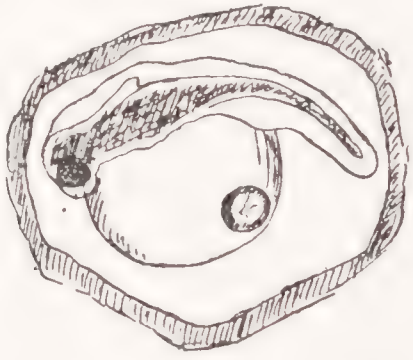
and the gull. Such an explanation is not needed in the case of the diver, which probably touched the Angler's trigger in the course of its dive; and no doubt the Angler sometimes gets a puffin or a guillemot in the same manner.

A funny story is told of a conger that had swallowed a baited hook, and in its efforts to get away from it fell into the maw of an Angler; but being there imprisoned, instead of going down the Angler's throat, as its captor desired, it made its way out by the gill opening, carrying with it, of course, the fisherman's line. When the fisherman landed his conger, he was astonished to find an Angler also, not hooked, but threaded, as it were, upon the line above the hook.

Another illustration of its readiness to snap at anything is furnished by the story of the Angler that got stranded on the beach and left by the receding tide. A fox sauntering that way, probably in the hope of finding a few crabs, came sniffing around the strange object, and happened to touch the sensitive process with his muzzle. In an instant his head was caught in the gin-like jaws, and in this situation the pair were found by passers-by.

The Angler that is not caught early grows to a length of six or seven feet, but the average size of

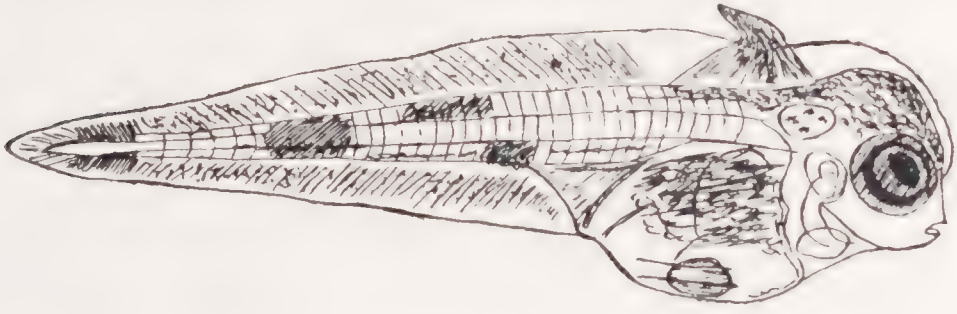
those that blunder into the trammels is between three and four feet long. Small specimens appear to be rare, though, of course, they must be really more plentiful than the large ones, for the number of eggs produced by one is computed to be considerably over a million. These eggs are sticky, jelly-like, measuring about one line in diameter, and adhering together in great sheets, which float on the surface of the sea, though, strange to say, these egg-sheets are not often



Embryo Angler in Egg.

seen. They appear to vary in length between twenty-five and forty feet, and in breadth from a foot to eighteen inches, but are only one egg thick. The young Angler leaves the egg with an open mouth—in which respect he is in advance of most larval fishes—and it already shows the beginning of its distinguishing feature of mature life, in a thick process from the back, behind the head, although later development shows this to be the hinder five of the six dorsal

fin-rays, the most important not being produced so soon. In these early stages the Angler is an active swimming fish, inhabiting the upper waters, and being thicker from back to belly than from side to side. The breast fins have not yet become thick paddles, but are more obviously formed for swimming purposes; whilst the throat fins, which ultimately become short and leg-like, are now of considerable length and produced backwards into long streamers,



Larval Angler.

one of which is at one period twice the length of the entire body. By-and-by, however, the young Angler has had enough of roving about in the upper waters, and settles down at an early age to a quiet life among the rocks and weeds at the bottom. The accompanying figures illustrate stages in the early development of the species, but the entire series has not yet been made out. Soon after it takes to the sluggish life it flattens out sideways and its eyes come to the top of

Post-Larval Angler.

its head, and the first dorsal ray lengthens and develops the loose membrane that is in future to betray any luckless fish that touches against it.

Many names have been bestowed upon this fish, which is plentiful all around our coasts, the names being more or less local in their use but all more or less expressive of its habits or appearance. It is the Toad-fish, Frog-fish, Fishing-frog, Sea-devil, Monk-fish, and Wide-gab. Monk-fish properly belongs to a species of dog-fish, the *Rhina squatina*, also known as angel-fish. The name by which naturalists know the Angler is *Lophius piscatorius*.

XIX.

OUR OCEAN FLORA.

THERE are certain branches of natural science which man in all ages has ignored, and one of these is the study of seaweeds. Only to be seen when the receding tide had left them on the rocks in a collapsed condition, their beauty was not obvious at a casual glance; nor did they produce brilliant flowers or edible fruits. Early references to seaweeds are always of a contemptuous character, the poet Horace, for example, describing them as "*inutilis alga*" and "*vilior alga*." Couched in the same spirit, though in recent times, was the remark of the botanist of repute of whom the story is told that upon being shown a collection of seaweeds, in the hope that the pains taken in their preservation and classification would earn a word of commendation from the great man, he dismissed them as beneath his notice, with the words, "Pooh, sir, a parcel of seaweeds!"

No botanist of to-day, great or humble, would take up such an attitude towards a branch of study of which he was ignorant; nor can the term "useless" be applied to seaweeds without exposing the ignorance of the speaker. The truth is, seaweeds are useful in a very high degree, though they may not be marketable, as roses and potatoes are. They perform in the ocean similar offices in purifying the medium in which they grow as do the tall trees, the grass, and lowly herbs of the dry land: they absorb carbonic acid gas and give off abundance of oxygen. They provide a cover and a dinner for innumerable forms of animal life; within the submarine jungles and forests many creatures find protection, and their myriads of floating spores are eaten by small animals which in turn become the food of fishes. The Diatoms, upon which oysters feed largely, are but a class of minute seaweeds. In addition, the larger weeds have value as manure; and they may be used in the manufacture of soda, as formerly they were largely employed. From them the chemist extracts the medicinally valuable iodine; but perhaps their greatest value of all to the dwellers on these little islands in the ocean consists in their constituting a natural breakwater. Were it not for the leather-like meshes

of the *Fuci* which grow from the rocks between tide-marks, the inroads of the sea upon our shores would be far greater than they are. A reef of weed-covered rocks is far more effective than some of the break-waters which man constructs. The breaker, coming in with full force to strike against the cliff, is entangled among the myriad branches of the seaweed, its force split up and dissipated.

There is really little excuse for ignorance concerning seaweeds on the part of any person who has access to the coast. In most cases specimens may be obtained in abundance; they are easily preserved, they present considerable variation in structure, as well as in form and habit, and their lines satisfy the æsthetic sense. In size they range from species which individually can be seen only with the aid of the microscope to the opposite extreme, where will be found the largest of all known plants, with branches hundreds of feet long. It will be understood that between these limits there must be a very large number of species; and yet—to show how once they were neglected — in the days of the great Linnæus there were but seventy species known from the whole world. To-day the student who confines his attention to the species that may be found upon

the British coasts has to deal with something like 450 kinds, to say nothing of Diatoms. The Diatom specialist who draws his specimens from all parts of the globe has the comparatively unrestricted field afforded by no less than 10,000 species. The possibility of using figures like these shows that there have been at least a few students to whom our ocean flora has not appeared absolutely uninteresting.

A noteworthy fact about these Algæ, no matter how large and tree-like they may be, is the absence of vessels; they consist of a mere aggregation of cells, which, though they do form simple tissues, are never differentiated into wood, bark, etc. Their hard parts, so far as they have any, are more of the consistence of cartilage than wood. They have no roots, but merely attachment discs, and these once separated from the rocks do not adhere again. The larger kinds grow from the solid face of the rock, no matter how hard, and not from fissures; therefore roots would be of little use to them, and, indeed, the fact that the whole surface of the plant absorbs its nutriment from the surrounding waters renders the possession of true roots unnecessary. The more minute species lead a free, roving life in the waters, especially near the surface, and may easily be palmed off as

animals upon those who regard the power of movement as an attribute peculiar to animal life. There are, indeed, a few forms, such as the luminous *Ceratium tripos*, which are claimed as subjects by both botanist and zoologist. The spores, or reproductive bodies, also move freely through the waters, some of them being propelled by the lashing of two or more *cilia*, until they settle down upon some surface and develop into new plants.

Some are coloured with most beautiful and delicate tints, others secrete coats of chalk or flint, and when they die these firm coats drop to the sea-bottom and contribute to the formation of those chalk-beds of the future which the *Challenger* naturalists discovered to be now in process of formation. Among these are masses which look exactly like coral from their solid stoniness, and we learn that they actually play a part in the construction of coral islands, helping to bind the work of the coral-polyps together. Even on our own coasts these attain sufficient size and hardness to do considerable damage to fishing-nets that come in contact with their short, hooked branches. There are beaches on our coasts where the fine yellow gravel is composed almost entirely of the broken pieces of these stony weeds.

As these plants produce no flowers, it is quite clear that they are not propagated by means of seeds, which are always the product of flowers of some kind. The seaweeds are reproduced by means of spores, which may be roughly and unscientifically described as detached cells having the power to give rise under suitable conditions to plants similar to those by which they were produced. These spores are of several kinds and of different morphological values, some being the product of a sexual process, others quite non-sexual in origin.

The vast number of seaweeds now known are arranged by systematists in four grand series, which are again divided up into cohorts, orders, tribes, and genera, or their classification would be unmanageable. It is not our intention to attempt to take the reader through the mazes of this system, but we do wish to glance at a few of the more striking representatives of these four principal legions. The first of the four series, known to science as the Cyanophyceæ, consists of plants of low order, usually characterized by their bluish-green colour. All these are not very distantly allied to Bacteria, and they are either single cells or single rows of cells. Many of them abound in the warm surface-waters of the ocean, some again boring

holes in shells on the bottom. Others, when they occur in waters strongly charged with lime, cause a precipitate of the same around them by the absorption of carbonic acid gas from the water. A red-coloured form—*Trichodesmium*—occurs at times in such vast quantity in warm waters that it has earned the name of Red Sea for that arm of the Indian Ocean which separates Arabia from Egypt and Ethiopia.

The second series, the Chlorophyceæ, are commonly bright green, and chiefly fresh-water forms, though there are a considerable minority of marine representatives. These are not found in deep water, and consist of one cell, branched or simple rows of cells, or thin layers. Among these single-celled forms are some of the most remarkable specimens of plant structure, for they appear to be of the most complex character. One of these, named *Caulerpa*, resembles nothing so much as a cluster of very intricately divided fern-fronds of great beauty. Yet all this lace-like division is found to be compatible with the unicellular type of structure. Astonishing as it may appear, the entire plant of *Caulerpa* is but a single cell drawn out into a cylindrical tube with many branches. The danger of any of these col-

lapsing is ensured against by the presence of minute beams and girders thrown across at intervals from wall to wall to keep them apart. *Caulerpa* does not occur on our coasts, the waters not being warm enough to suit it; but nearer to the tropics it may be found growing out from the submarine rock-walls, much as the Polypody-fern climbs the terrestrial walls and trees of our own country. It is said to be a favourite food of the turtle.

Bryopsis plumosa.

A very similar species, *Bryopsis plumosa*, may be found in the rock pools of the English Channel. It will not be found in profusion, but chiefly isolated specimens growing out from the wall of a pool, or more rarely from a shell or stone at the bottom. It resembles a miniature clump of male-fern, and here again the whole plant consists of but one cell. A

similar arrangement prevails in *Codium*, though the outward form is very different. Here the frond forks again and again into erect, more or less cylindrical, woolly branches, somewhat slimy to the touch—all merely divisions of one cell.

In this group we find the plant popularly known as Sea Lettuce (*Ulva latissima*), from the frond being a thin, broad, crinkled expansion, very similar to a lettuce-leaf in consistence and colouring, though lacking the midrib and veins. In the genus *Monostroma*, found principally on the west coast and along the Channel, the frond, though composed of a great number of cells, is only one cell thick. In the better-known *Ulva* that grows abundantly on stones in shallow water we have a similar kind of frond, but it is two cells thick. The still more plentiful *Enteromorpha*, with which some of the higher-lying pools are filled, is first shaped like long, slender ribbons two cells thick, but after a little while so much oxygen gas is given off between these layers that the frond becomes a distended tube.

Here, too, is placed the remarkable genus *Zoochlorella*, whose members exist as separate cells in the bodies of low forms of animals (Radiolarians), where they were discovered long ago and known as "yellow

cells," but their true nature has only been known in later years. To some extent at least the animal derives sustenance from the products of the plant's vital activity, and the plant apparently subsists upon the waste of the animal organism. Some of these smaller organisms, had they but consciousness of what is being done by scientific men, would either be enjoying considerable fun because zoologists claim them as animals of low estate and botanists declare they are plants, or they would be intensely miserable because of their equivocal position and uncertain status in the scale of life. *Ceratium tripos* is one of these —a minute organism with three processes looking like a pair of slender wings and a tail; in addition it has a long lash, by the movement of which it is propelled through the surface-waters near the coast. At night it gives forth a silvery light, and much of the luminosity of the sea is due to this plant (or animal ?). It occurs all round our shores in enormous quantities, and forms a principal ingredient in the food of the very small animals which in turn are consumed by the fishes. Such forms, with Diatoms, may really be considered the basis upon which the whole fabric of animal life in the sea is built up. An allied species, *Pyrocystis*, though it is not found

in British waters, is interesting, not only because it is equally luminous—and the *Challenger* naturalists attributed to it some of the most glorious displays of marine fireworks they witnessed in the tropics—but also from its strong resemblance to *Noctiluca*, the infusorian which causes much of the luminosity of our own seas.

The third series, the Phæophyceæ, is more popularly interesting because its members are mostly of considerable size, and include familiar Wracks, Tangles, and Oar-weeds, as well as the huge *Macrocystis* and *Lessonia* of other seas. Among the species of *Fucus* which cover the littoral rocks, it is quite a common thing to find the fronds buoyed up by air-bladders which form in the central layer of cells. The stems of these weeds are of very dense, horny consistence, and they are incapable of floating without the aid of the air-bladders. Growing, as all these olive weeds do, on the exposed rocks in no great depth of water, they must be sufficiently tough to withstand the constant fretting of the surf and the greater friction caused by the waves in stormy weather. But stubborn, hard-wearing material of this sort has to be built with such solidity as is not consistent with buoyancy—that is, if the thin, flexible type of frond

is to be retained. So a compensating element is brought in, and these round or oval bladders are

Bladder-wrack (*Fucus vesiculosus*).

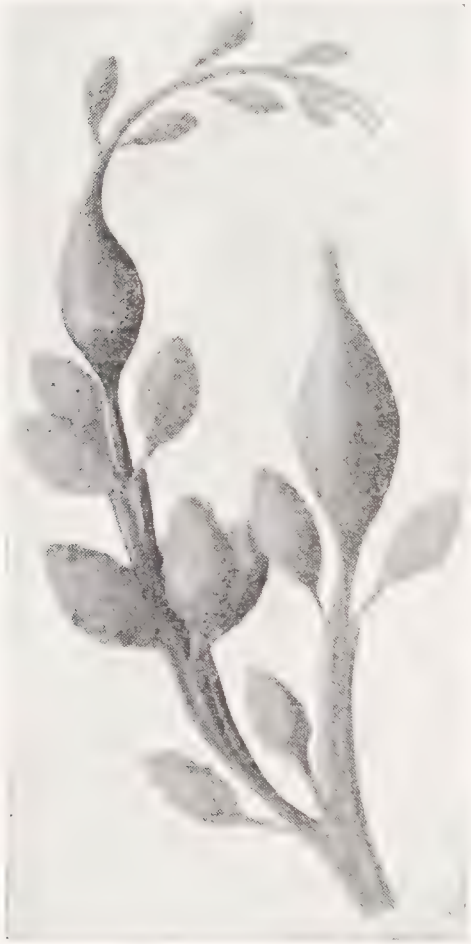
formed and filled with nitrogen and oxygen. In *Fucus vesiculosus*, the familiar Bladder-wrack, these are scattered irregularly over the frond, on each side

of what appears to be a midrib, though it does not exactly correspond with the midrib of true leaves.

Saw-edged Wrack (*Fucus serratus*).

The Saw-edged Wrack (*Fucus serratus*), which has a broader, thinner frond, has no vesicles; but in the Knotted Wrack (*Ascophyllum nodosum*) the bladders

are more evident than the frond itself, which is, in truth, reduced to a cord upon which the bladders appear to be threaded. In the Pod-weed (*Halidrys siliquosa*) they are always at the extremity of the lateral shoots, and are of long, narrow shape, with slight constrictions which give them the appearance of furze-pods.



Knotted Wrack (Ascophyllum nodosum).

The reproduction of these olive weeds is of a high order, there being a distinct process of fertilization of *oogonia* by motile *antheridia*, which are often produced in different conceptacles. These are usually found near the tips of the shoots, and in some cases —as in *Fucus serratus*— these are distinguished by a spongy enlargement in which the conceptacles are embedded. In the Sea Thongs (*Himanthalia lorea*) these specialized branches become the most conspicuous parts of the whole plant, which is ordinarily a

mere button-like disc, little more than half an inch across. From the depressed centre of this arise the

Pod-weed (*Halidrys siliquosa*).

fertile branches, which are three or four feet in length, dotted with minute punctures, which are the openings of the conceptacles. In *Cutleria multi-*

fida the spores are borne on the outside of the frond.

Among noteworthy members of this olive series

Sea Thongs (Himanthalia lorea).

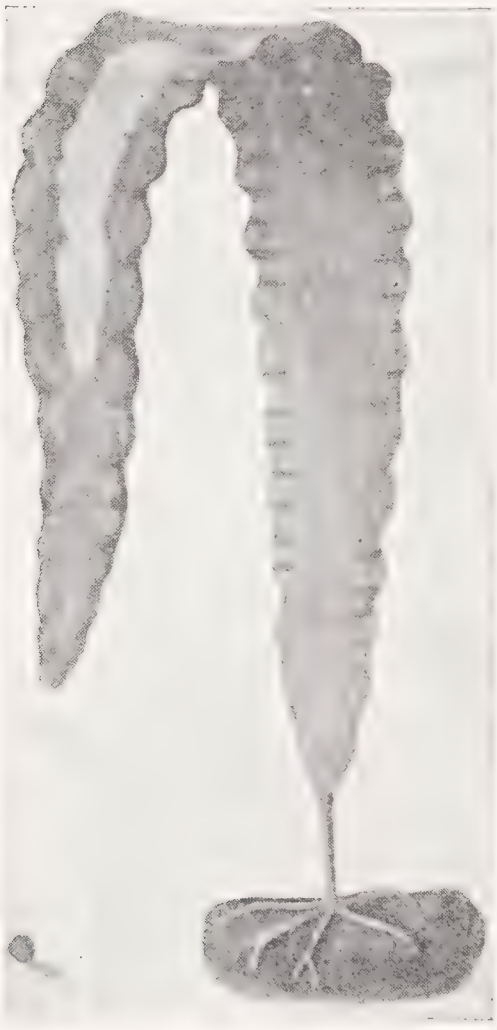
we may mention the Gulf-weed (*Sargassum*), of which there are about one hundred and fifty species, some of them constituting the enormous floating beds of tropical seas. The Gulf-weed is buoyed up by spheri-

cal bladders the size of a pea, and is not known to occur in a fixed condition, though some authors have fancied they must grow attached to rocks and afterwards become detached. Occasionally stray pieces are drifted to our shores, carried hither by the Gulf Stream; but the great mass which Columbus saw in the Atlantic, and which still occupies practically the same position, has an area of about two hundred thousand square miles. Of somewhat similar character, though without the leaf-like branches, is *Cystoseira ericoides*, a plant that is attached to the rocks of our own shores, and which attracts the attention of those who go down to the sea at low-water, because when submerged it has a pearly iridescence playing over it, but great is their disappointment on hauling it out to find the colour-beauty has departed. Another beautiful member of this series is the so-called Peacock's-tail (*Padina pavonia*), whose fan-shaped frond, with its several curved divisions, is prettily zoned with

Peacock's-tail (Padina pavonia).

bands of glistening hairs, from which the light is reflected with prismatic effects. This species will only be found on our southern coast on sandy bottoms.

The group of Laminarians are bold and conspicuous objects just below ordinary low-tide marks all round our shores, and form a submarine forest in which many creatures find sanctuary. They are distinguished by the flat, broad fronds, which are divided into a leaf-like and a stalk-like portion, and have this remarkable character, that the growing-point is not at the free end of the frond, but situated between the stalk and the blade, so that growth of these two parts takes place at the same time by the multiplication of the cells at this point. Another remarkable feature is the annual shedding of the blade of the frond and the subsequent growth of



Sugar Tangle (*Laminaria saccharina*).

a new one from the summit of the stalk. The Sugar Tangle (*Laminaria saccharina*), which produces crystals of mannite on its frond, has a short, thin stalk, and a thin, puckered blade; it is commonly used by people inland as an indicator of coming rain. The Oar-weed (*Laminaria digitata*) is an advance upon this, the stalk being large and thick, and the blade split up into a number of long, finger-like segments. These plants are attached to rocks and stones by claw-like processes, popularly regarded as roots. The Badderlocks or Murlins (*Alaria esculenta*), parts of which are eaten raw by poor people on some portions of our coasts, is of this group also; it has a long, cylindrical stem, and a midrib to the blade. This blade is always a good deal split by the waves, and ranges in length from three to twenty feet. What

Badderlocks (Alaria esculenta).

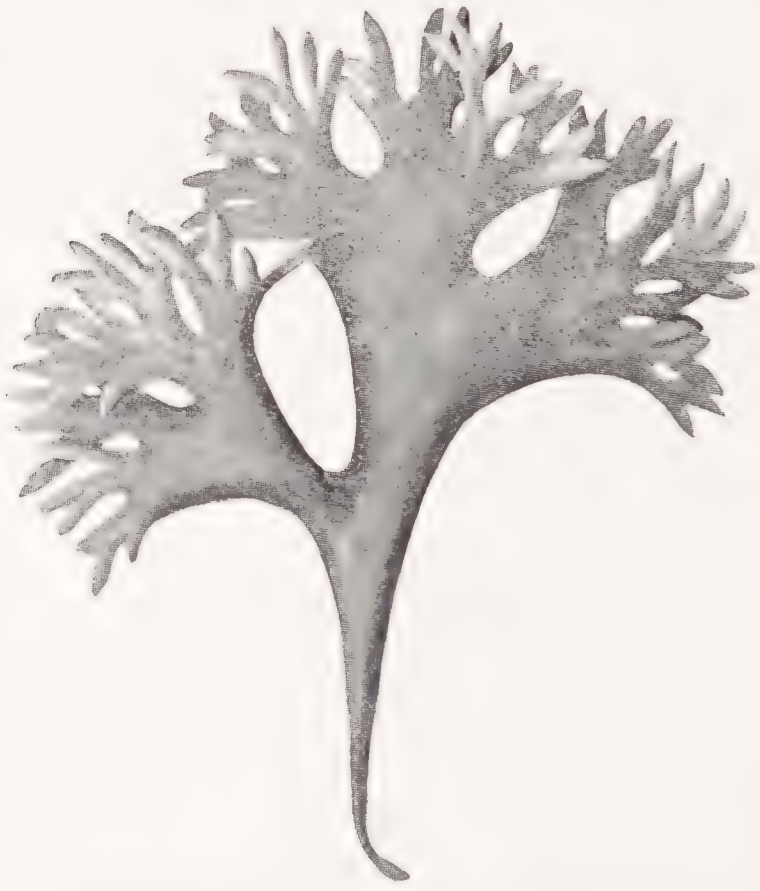
appear to be young fronds spring in clusters from each side of the stalk, but are really special organs (*conceptacles*) in which the spores are produced. The Sea Furbelows (*Saccorhiza bulbosa*) has a thick, heavy stem, three or four inches broad and as many feet in length, from whose summit springs a broad, thin blade, split up into ribbons. At the lower end of the stem there is a more or less spherical cavern or congeries of caverns, formed by the growth of the attachment suckers.

The well-known Sea Lace (*Chorda filum*), though closely allied to the Tangles, presents a strong contrast to them. There is here no distinction between blade and stalk, the entire frond consisting of a very long and slender frond of equal thickness throughout, like an immense leather boot-lace. No matter how long these may be, they never fork or branch.

The fourth series—the Rhodophyceæ, or Red-weeds—are remarkable as a rule for their splendid colouring, and many of them on account of the delicate beauty of their fine divisions. In none of them do we find that great elongation and branching of a single cell we noticed in *Codium* and *Bryopsis;* these are all multicellular. Growth always proceeds from a cell at the extremity of the shoot, and the branch-

ing is effected by the lateral division of this cell. There is a mode of reproduction peculiar to this series, and distinctly sexual; a female cell or *carpogonium* being fertilized by non-motile male-cells known as *pollinoids*, which are wafted through the waters much as the pollen-cells of fir-trees are carried by the wind. These red-weeds always claim principal attention from the seaside visitor who has an idea of learning something of the treasures of the deep, though, as a rule, he only gets the bruised and broken specimens that have been cast up by the waves. They will be found in all their beauty at extreme low-water, growing from the rocks under the shadow of the larger *Fuci*, and further out beneath the great Tangles. We should explain that what are known as red-weeds are not really red in all cases—some are nearly white, others yellowish, purple, or brown—but the great majority of the species are red beyond question, and most beautiful tints of red. And their colour has relation to their habitat. The few bright green seaweeds are found very near high-water, the olive-coloured *Fuci* just below them, and the red below these. It would appear that as certain of the rays of light become obstructed by their passage through the waters, the

quality of the light that reaches the deeper parts is impaired, and the ordinary processes cannot be carried on by the chlorophyll of the weeds unless it is masked by tints of olive, brown, or red, according to depth.



Carrageen or Irish Moss (*Chondrus crispus*).

A well-known species in this series is the Carrageen or Irish Moss (*Chondrus crispus*), which is very variable both in form and colour. The frond is flat and fleshy, branched again and again in the same plane; in some forms these branches so overlap as

to leave very regular elliptical spaces between, as shown in the figure. In colour it may be greenish white, white with crimson tips, yellow, or purplish. It was in repute thirty or forty years ago as an invigorating, easily-digested food for invalids, but lately little has been heard of it. Another of the

Dulse (*Rhodymenia palmata*).

edible red-weeds is the Dulse (*Rhodymenia palmata*), with a dull purple frond divided into a number of slender lobes, which branch off in a fan-like manner from a common base. Under the same name in some districts there is also eaten an undivided iridescent purple strap called *Dilsea edulis*. We have never

tried these weeds as food, but we learn from those who have that their chief recommendation is that they are better than nothing; that being so, we have deferred the experiment until harder times come. At present we are content to feast upon them in the æsthetic sense.

Another plant bearing a similar name is the Pepper Dulse (*Laurencia pinnatifida*), only an inch or two high, like a minute purple fern of the Polypody type, growing over the rocks between tide-marks. Here, too, we find the Purple Laver (*Porphyra laciniata*), esteemed of epicures, closely resembling the Sea Lettuce (*Ulva*) in general form, but of much firmer texture, and of dull purple colour. The group also contains such beautiful forms as the cactus-like *Catenella opuntia*, the somewhat similar but larger and more beautiful *Lomentaria articulata*, the purple, hair-like *Cystoclonium purpurascens*, the *Nitophyllums* and *Delesserias*, the *Ceramiums*, the *Polysiphonias*, and the *Plocamiums*, of clearest crimson tints and most delicate filaments. These are subjects that the tyro in seaweed-collecting considers his most desirable finds, and they certainly invest his album with striking beauty. Another group — most of which do not find their way into the albums — in-

cludes the Corallines, the *Melobesias*, and the *Lithothamnions*, plants which coat themselves with a stony crust of lime, so that their vegetable character was long unsuspected, some species being regarded as of similar nature to corals, and others as mineral matter. The Corallines have slender, branching, jointed fronds of white or purple; *Melobesia* coats the surface of submerged rocks and lines the pools; *Lithothamnion* forms irregular masses in the deep pools and at low-water.

For the present, enough has been said to show that the "worthless Algæ" are worthy of consideration, and that the nature-lover will find among them no lack of variety in form, colour, habit, or habitat, and that in all respects they are deserving of a better fate than passing them over as being unworthy of our consideration or study. Many an otherwise dreary seaside vacation might be made a time of mental rest and real recreation by a little knowledge of the myriad forms of life with which the sea is teeming.

XX.

CAST UP BY THE SEA.

IT was between autumn and winter when I took up residence in a Cornish coast village, at a time when half a gale was blowing from the east. For a fortnight or more the wind kept in the same quarter, so that one might fancy the vane on the coastguard's flagstaff had become fixed by rust. During the time, of course, the intensity of the wind pressure varied from a steady breeze, that flecked the bright blue water with little scudding white-crested waves, to a roaring, tearing gale and a half, that rocked the houses and threw up mountainous waves out in the Channel. These, as they came nearer and nearer, reared into huge malachite arches and flung themselves with thundering roar on the rocks, bringing down masses of the looser cliffs, and puffing a cloud of white spray high into the air, to be

caught by the breeze and carried far inland. On the latter occasions all those who had boats among the rows that were snugly moored stem and stern in the pool below watched anxiously from the wall above, lest the mooring-lines should part or the great sunken chain to which they were all attached should be torn from its fastenings at the bottom. Others who felt not this anxiety crouched in the lee of the coast-guard's hut, and with spyglass scanned the sea, whilst between the gusts they conversed of similar days or nights in past years and the things that happened.

Eager to see the grand play of the waves on this rugged coast, I walked away from the village southward along the cliffs, where the land ran out farther into the Channel and received the full force of the gale. It was a grand sight to see the waters shooting up the cliffs, then falling back and carrying huge boulders with them. Places that I knew as beautiful beaches had been denuded of sand and shingle and showed a clean floor of smooth blue rock, whilst other coves were piled high with wrack and tangles that had been torn from the fringing rocks.

I had been told by those who pretended to a wide and deep knowledge of men that country folk were more or less dead to the grandeur of Nature, except

so far as an occasion like this might fill them with apprehension for the safety of friends or property. Yet as I sauntered along the cliff I found there were many others who had come out evidently to enjoy the spectacle. They crouched under stunted bushes or behind the hedges that divided the cliff-lands—all keeping a sharp pair of eyes upon the sea and shore below.

When I had lived longer among these good people I found that very few of them were actuated by the sentiment that moved me to brave the furious blasts, which I had attributed to them also. After the fury of the gale had abated I would walk along the shore at the base of the cliffs, picking up shells and other treasures from deep water that had been cast up by the racing of the waves down Channel so continuously. As I rounded a projecting shoulder of rock I would come suddenly on one or two of my neighbours hauling in something from the margin of the waves—a log of wood, a broken spar, a hatchway, or barrel. After dragging it up the foot of the cliff they would hide it among the reeds or other tall vegetation, whence it could be recovered after dark and taken by roundabout routes to their homes.

The law requires that all things cast up by the

sea should be handed over by the finder to the coast-guard officer, by whom, after a certain period, it is sold, and one-third of the proceeds handed to the salvor; but as a matter of practice there are many things washed ashore to which no money value will attach, though they may be worth picking up by poor persons. I have seen many respectable women taking their afternoon stroll along the beaches and filling a hand-basket with bits of wood which could be dried and used for kindling. Yet things of greater importance were found from time to time which never came under the official eye of the coastguard. It is, perhaps, as well that they did not, for I know that some of the things that did involved so much form-filling, reporting, and letter-writing to head-quarters that the trivial sum received on sale did not pay the expenses of stationery, postage, sealing-wax, and—red tape. It may therefore enter into the minds of the more intelligent officers—I do not assert as a positive fact that it does—that they had better be looking the other way when such trash washes in.

In most of the gardens round about, the dahlias and sunflowers were staked with stout bamboos. These also are the products of "wrecking," great numbers having been washed in from time to time.

In certain unpretentious cottages I know the inmates used nothing but wax candles to illuminate their rooms for several years—real wax candles, none of your paraffin or composite. Some vessel that had broken up in the vicinity included wax candles in her cargo, and these had got loose. A southerly gale, some winters ago, littered the shore with candles of all sizes, the biggest of them obviously intended for altar lights. A friend of mine wandering along shore found so many that he had to go home for a large-sized galvanized bath, which he filled with the candles. A rinsing in warm fresh water soon got rid of the salt from wax and wick, and they burnt as well as though they had never been to sea. Each winter since then a number of them rolled in after a southerly breeze, showing that there is still a good stock below.

Barrels of tar and petroleum have landed themselves at different times, and during a gale considerable interest and excitement have been manifested by the appearance of some dark object bobbing up among the waves a mile or two out. It might be a cask, it might be a boat, it might be a corpse. Glasses are levelled upon it, but with a strong sea running, and a high wind blowing, nothing positive can be made

out by the loungers along the sea-wall; yet some of the men would be certain it was this or that. Then a couple of hardy crabbers would put off in their boat to interview it, and after much risky trouble would succeed in hitching a noose rope over it, and getting it in tow. This time it is an upturned boat with a hole in its bottom. Next time it may be a balk of timber, or a derelict log that has been floating for many a day in mid-Channel, and has only now got into a landward current. The evidence of this is afforded by the fact that from end to end, and from side to side, it is perforated with the cement-lined tunnels of the teredo or ship-worm, which have rendered it worthless. A few years ago a timber ship went to grief on some rocks a little to the north-east; and during the following week all the coves and beaches westward were receiving new deals, thousands of them being recovered for the underwriters.

One summer Sabbath when we were all at morning service, a coastguard, spying along the coast from the look-out, saw something washing ashore about a mile to the south. Hurrying along the cliff, he made out its nature, as he thought, and then hastened up to the parish church at the top of the hill to

inform his officer, who was attending the service there. I do not know by what system of wireless telegraphy the news spread, but it is certain that before the preachers' discourses were well finished in church and chapels alike, the bulk of the respective congregations knew that a yacht had come ashore, and as soon as the benediction had been said, instead of the customary loitering round the doors, all streamed in one direction—away from the village. The cliffs that morning were a sight. About two-thirds of the entire population were scattered along there in all their Sabbath finery—and we are fine on Sundays, I assure you. The coastguard had reported to his officer that it was a yacht, and that, of course, suggested a crew also. We therefore expected to take a hand in rescuing them, and we should have felt glad that they had arrived in time to join us at dinner. But, to our disgust, when we reached the spot we found no yacht, but an empty Berthon collapsible dinghy pulled up on shore, and no crew visible. Our solicitude for the wrecked crew was turned to jeering hilarity. The coastguardsman who had blundered received a severe "wigging" from his officer for his inaccuracy of observation, and as he and his mates carried the "wreck" to headquarters

he found himself the butt for a good deal of chaff from the populace.

Another time it is a keg-buoy with a stout hawser attached, the whole being covered with ship-barnacles. One winter, oranges were plentiful along the shore, but most of them had been in the water too long to be eatable. A chest of tea on another occasion rewarded a watcher on the cliffs, and this had to be brought to the notice of the coastguard, who broke it open to ascertain the condition of its contents. Finding the lead had got broken at one corner—I believe it was done by the finder—he pronounced it worthless; but the finder satisfied himself that very little of the tea was damaged, and the bulk of it provided his family with an abundant flow of the cheering beverage for months after. Several of the boats in the porth that were let out to summer visitors were nicely fitted out with stern-sheets of polished fancy woods, and I found on inquiry that the bountiful sea had furnished the materials, which appeared to have done duty as cabin-fittings in some fine vessel that had gone to pieces.

Occasionally we came across a remarkable bit of wreckage, as for example one of the huge glass carboys in which acids are sent out from the chemical

factories. This was found among the rocks when the tide had gone out, and its position on its side, half-filled with water, showed that it had not floated ashore, but had evidently been rolled in from deep water. Although among the rocks on a rough bottom, there was not a crack about it. One day a fisherman brought the skin of a large bird which he had picked up floating on the sea, and as he could not remember to have seen any bird like it, he wished for my opinion respecting it. It was a fresh skin, and a slight examination showed it was that of an albatross. The best explanation I could offer for its appearance on our coast was that somebody had been making the attempt to bring the living bird home from the south, but it had died on the way, and he had skinned it; in the process of drying it had got blown overboard. It looked like the work of a seaman, for it had been rather clumsily done, and the feet were missing. Of course, the bodies of our native birds were plentiful after storms—mostly birds of the first year that had succumbed to a continuance of bad weather, when they had probably been unable to wrest their food from the troubled waters. Some of these were living, but exhausted, and after a day or two's rest and feeding were able to resume the battle of life.

Among the latter was a Slavonian Grebe, a bird not often found so far south.

But bigger game than any of these came to land at times, in the form of sheep and oxen, probably washed off the decks of ships in bad weather. I have seen as many as seven sheep come drifting into our porth in one day. These had to be taken in hand by the coastguard and buried in the cliffs. This was often an unpleasant job, if the carcasses had been floating about for any length of time. It was worse in the case of the bullocks, because they were so bulky they would sometimes get wedged between rocks, necessitating cutting up and piecemeal extraction, whatever their condition. From time to time, too, the stranded derelicts were human. One spot on the cliffs is known as Sailor's Grave, and quite close to the edge there are two flat stones stuck in the turf, edgeways and parallel, about a fathom apart. The poor unknown fellow that lies beneath came in many years ago in such a condition that removal to the churchyard was out of the question, so they laid him to rest at the top of the cliff.

To this instinctive watching for what the sea may cast up the people apply the term "wrecking," and

there can be little doubt that the use of such a word has caused much misconception of the Cornish character. The Cornishman of the past was an inveterate smuggler, who could easily reconcile his disregard of the excise laws with his religion; but it is probable that many, if not all, the stories told of his luring ships to their destruction owe their origin to the improper application of the word "wrecking" to the process of salving wreckage for his own or others' benefit.

THE END.

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